6.5 - Internal Quality Assurance System		
6.5.1 - Internal Quality Assurance Cell (IQAC) has contributed significantly for institutionalizing quality assurance strategies and processes visible in terms of Incremental improvements made during the preceding year with regard to quality and post-accreditation quality initiatives (Second and subsequent cycles)		
S.No.	**IQAC proposed actions**	**Institution implemented actions**
1	To conduct Faculty Development Programme on "Digital Teaching".	Conducted Faculty Development Programme on Digital Teaching Techniques from 01.06.2020 to 03.06.2020 by IQAC and DCE Technology, Virudhunagar.
2	To conduct Webinar on "Outcome Based Education"	Conducted Webinar on "Outcome Based Education" by IQAC on 08.06.2020 & 09.06.2020.
3	To conduct Webinar on "Outcome Based Assessment Strategies"	Conducted Webinar on "Outcome Based Assessment Strategies" by IQAC on 18.07.2020.
4	To conduct Faculty Development Programme on "Handling Classes through Google Meet"	Conducted Faculty Development Programme on "Handling Classes through Google Meet" by IQAC on 06.08.2020.
5	To conduct Faculty Development Programme on "Handling Google Classroom for Evaluating Student Learning"	Conducted Faculty Development Programme on "Handling Google Classroom for Evaluating Student Learning" by IQAC on 20.08.2020.
6	To instigate the department to sign MoUs with reputed organizations and institution.	Four MoUs have been signed with reputed research and service organizations. 1. Coral Travel Wings , Virudhunagar, 2. PEARL-A Foundation for Educational Excellence, Madurai on 18.03.2021, 3. E.M.G. Yadava Women's College, Madurai on 19.03.2021, 4. RiseSharp Technologies ("RiseSharp"), Hyderabad, Telangana on 14.12.2020
7	To apply for NIRF 2021 on College category and Overall category.	Ranked 47th in NIRF 2021 on College category.
8	Preparation of AQAR for 2019-2020	Submitted for AQAR for the year 2019-2020
9	To Conduct Academic Audit	Due to Covid-19 Academic Audit was conducted on 02.09.2021 for the academic year 2020-2021
10	Scholarship to the meritorious students by the College Managing Board	108 meritorious students were benefited by getting College Managing Board Scholarship HOPE (Helping Others Pursue Education)
11	Project Assistance for the students by the College Managing Board	92 students were benefited from PASS (Project Assistance for Students by the Managing Board) for doing Student Project
12	Research funds to the faculties for the research projects by the College Managing Board	13 staff members were benefited for doing their research works by getting Seed Money from the College Managing Board

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Virudhunagar – 626 001.

14.09.2020

MINUTES OF THE TWELFTH ACADEMIC COUNCIL MEETING

The Twelfth Academic Council Meeting of Virudhunagar Hindu Nadars' Senthikumara Nadar College (Autonomous) Virudhunagar was held on 14.09.2020 (Monday) at 4.00 pm. in Google Meet Platform.

The Chairperson and Principal welcomed the gathering.

The Chairperson introduced the newly nominated members Dr. J. Samuel Kirubahar, Head, Department of English, Dr. K. Nagarajan, Head, Department of Zoology, Dr. G. Murugesan, Head, Department of Business Administration, Dr. M. Murugesan, Head, Department of Commerce CA (SF), members in Academic Council, Dr. M. Meena Devi, Dean Curriculum (Arts) – Principal Nominee, Dr. P. Mehalingam – Principal Nominee and Dr. S. Muthulakshmi, Additional Dean Curriculum (Arts) – Special Invitee, to the Academic Council forum.

The Principal presented before the Council a brief progress report on Autonomy.

Nine subjects were presented for resolution:

Subject 1:

Approval for the new University nominees nominated to the Board of Studies of B.Voc. Environmental Assessment and Remediation, B.Voc. Food Safety & Quality Management and B.Voc. Renewable Energy.

Dr. K. Nagarajan, Dean Curriculum (Science), moved the subject for the approval by the Academic Council for the induction of new University Nominees nominated to the Board of Studies of B.Voc. Environmental Assessment and Remediation, B.Voc. Food Safety & Quality Management and B.Voc. Renewable Energy. The list of new members is given in **Annexure – I.**

Resolution

The subject was considered and resolved to approve the new members nominated to the respective Board of Studies.

Subject 2:

Approval for the revised syllabus for the third year UG programmes, B.A. History, B.B.A, B.Sc. Botany, B.Sc. Chemistry, B.Sc. Physics, B.Com, B.Com. CA, B.Sc. Microbiology, BCA, NCC-NME passed in the Board of Studies Meeting.

The Principal invited the Chairpersons of the Board of Studies to move the subject for the approval of the Academic Council.

Dr. G. Ravi, Chairperson, Board of Studies of B.A. History, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year B.A. History passed in the Board of Studies meeting held on 29.02.2020 and also for the new subject code allotted to each subject as given in Annexure-II.

Dr. B. Ravichandran, Chairperson, Board of Studies of B.Com. and B.Com.CA, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year and for the Value Added Course viz. ***Financial Accounting Using Accounting Software*** passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Dr. G. Murugesan, Chairperson, Board of Studies of B.B.A., moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year and for the Value Added Course viz. ***Elements of Tally, Investment Avenues*** and ***Secretarial Practice*** passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Dr. N. Prithivikumaran, Chairperson, Board of Studies of B.Sc. Physics, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year B.Sc. Physics passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Dr. C. Karunakaran, Chairperson, Board of Studies of B.Sc. Chemistry, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year and for the Self-Learning Course viz. ***Chemistry Competitive SkillDevelopment Course*** and ***Critical Analysis Of GATE/CSIR-NET Questions***

passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Mrs. B. Salocia Fernando, Chairperson, Board of Studies of B.Sc. Botany, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year and for the Self-Learning Course viz. ***Food science and Nutrition*** passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Dr. A. Balasubramanian, Chairperson, Board of Studies of B.Sc. Microbiology, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year and for the Diploma Course viz. ***Diploma in Health Inspector*** and ***Diploma in Bio Technology*** passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Mr. D. Rajkumar, Chairperson, Board of Studies of B.C.A, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year and for the Value Added Course viz. ***Office Automation Lab*** and ***Creative Game Development Lab using Greenfoot*** passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Lt. Dr. N. Alagumanikumaran, Chairperson, Board of Studies of NME – NCC, moved the subject for the approval by the Academic Council for the revisions in the syllabus of the third year NME - NCC passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Resolution

The subjects were considered and resolved to approve the revisions made in the syllabus for the third year UG programmes, the new syllabus framed for the Value Added Courses, Self Learning Courses and Diploma Courses, and new subject codes allotted to them passed in the Board of Studies Meetings held on 29.02.2020.

Subject 3:

Approval for the new syllabus passed for the second year B.Sc. Physical Education and B.Voc. programme on Food Safety and Quality Management in the respective Board of Studies Meeting.

The Principal invited the Chairpersons of the Board of Studies to move the subject for the approval of the Academic Council.

Dr. T. Murugesan, Chairperson, Board of Studies of B.Sc. Physical Education, moved the subject for the approval by the Academic Council for the new syllabus of the Second year B.Sc. Physical Education passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Dr. A. Balasubramanian, Chairperson, Board of Studies of B.Voc. Programme on Food Safety and Quality Management, moved the subject for the approval by the Academic Council for the new syllabus of the Second year B.Voc. Programme on Food Safety and Quality Management passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Resolution

The subjects were considered and resolved to approve the syllabus framed for the second year B.Sc. Physical Education and B.Voc programme on Food Safety and Quality Management passed in the Board of Studies Meetings held on 29.02.2020 and also the new subject code allotted to each subject.

Subject 4:

Approval for the syllabus revised for the first year M.C.A and for the Value Added Course passed in the Board of Studies Meeting.

The Principal invited the Chairperson of the Board of Studies to move the subject for the approval of the Academic Council.

Mr. D. Rajkumar, Chairperson, Board of Studies of M.C.A moved the subject for the approval by the Academic Council for the revisions in the syllabus of the first year and for the Value Added Course viz. ***Data Structures***, ***Computer Algorithms*** and ***System Software*** passed in the Board of Studies Meeting held on 29.02.2020 and the subject codes allotted to them are given in Annexure-II.

Resolution

The subject was considered and resolved to approve the revisions made in the syllabus for the first year MCA , and the new syllabus framed for the Value Added Courses, and the new Subject Codes allotted to them passed in the Board of Studies Meetings held on 29.02.2020.

Subject 5:

Approval for the new syllabus passed for the first year B.Voc. Renewable Energy in the respective Board of Studies Meeting.

The Principal invited the Chairperson of the Board of Studies to move the subject for the approval of the Academic Council.

Dr. N. Jeyakumaran, Chairperson, Board of Studies of B.Voc. Renewable Energy moved the subject for the approval by the Academic Council for the new syllabus of the first year B.Voc. Renewable Energy passed in the Board of Studies meeting held on 29.02.2020 and the subject code allotted to each subject as given in Annexure-II.

Resolution

The subject was considered and resolved to approve the syllabus framed for the first year B.Voc. Renewable Energy passed in the Board of Studies Meetings held on 29.02.2020 and also the new subject code allotted to each subject.

Subject 6:

Approval for the relaxation of eligibility criterion for appearing for Common Self Learning courses *Gandhian Thought* and *Human Rights.*

Dr. M. Meena Devi, Dean Curriculum (Arts), moved the subject for the approval by the Academic Council for the relaxation of eligibility criterion for common Self Learning courses *Gandhian Thought* and *Human Rights* that the students who can appear for a self learning course should not have any arrear in the previous Semesters. It is recommended to relax the criterion for these courses for the benefit of the UG students in the IV semester.

Resolution

The subject was considered and resolved to approve the relaxation of eligibility criterion for common Self Learning courses *Gandhian Thought* and *Human Rights* for the benefit of the UG students in the IV semester, and hence hereafter the students, despite having arrear in the previous semesters, can opt for these courses.

Subject 7:

Approval for the new subject codes allotted to all the courses in the 1st year and 2nd year PG programmes.

Mrs. B. Salocia Fernando, Additional Dean Curriculum – Science, moved the subject for the approval by the Academic Council for the new subject codes given to all the courses in the 1st year and 2nd year PG programmes , as the ratio between the Internal and External marks for all the PG programmes was revised as 40:60.

Resolution

The subject was considered and resolved to approve the new subject codes allotted to all the courses in the 1st year & 2nd year PG programmes.

Subject 8:

Approval for the conduct of online class during the pandemic situation of Covid - 19.

Dr. M. Meena Devi, Dean Curriculum (Arts), moved the subject for the approval by the Academic Council for conducting online classes to the students of our college from

3rd August 2020 onwards, due to the prevailing pandemic situation of Covid – 19, as per the instruction of Tamilnadu Government.

Resolution

The subject was considered and resolved to approve the conduct of online classes in the college from 3rd August 2020 onwards, as per the instruction of Tamilnadu Government.

Other matters :

Dr. A. Sarathi, Dean - Internal Exams, moved the subject for the approval by the Academic Council for the conduct of Summative Examinations April 2020 through online mode and internal valuation of answer scripts by our college faculty, due to the current pandemic situation of Covid – 19.

Subject 9 :

Approval for the conduct of Summative Examinations April 2020 through online mode and Internal Valuation of answer scripts.

Resolution

The subject was considered and resolved to approve the conduct of Summative Examinations April 2020 through online mode and internal valuation of answer scripts by the college faculty themselves, due to the current pandemic situation of Covid – 19.

As per the instructions from Madurai Kamaraj University and the V.H.N.S.N. College Academic Council Meeting, Summative Examinations April-2020, for final year UG & PG students will be conducted from 21st to 28th September 2020 only through online mode. The instructions regarding Summative Examinations will be posted in our college website. For further queries, the college will provide helpline and contact numbers.

The students will be writing the examination from their home. The students will write the exam by entering through the Google Classroom with the link to be sent to them through their college email. Question papers will be posted in the Google Classroom 15 minutes before the scheduled time, i.e. at 9.45 am for the forenoon session and 1.45 pm for the afternoon session.

The students and their parents are instructed to sign in each and every page of the answer scripts. They should send the photos of their answer scripts to the respective Google Classroom within one hour after the completion of examinations.

If any student is unable to write the examination on the stipulated date due to health issues or unavoidable reasons, the supplementary test will be conducted. The student can write the exam from home.

All the Nine resolutions were unanimously passed.

Out of 38 members, 34 turned out for the meeting and 4 members got permission to be absent.

Members Present:

1.	Dr. P. Sundara Pandian	Principal & Chairperson
2.	Mr. P.K. Arunachalam	Head, Department of Tamil
3.	Dr. K. Sridhar	Head, Department of Tamil. (P.G)
4.	Dr. J. Samuel Kirubahar	Head, Department of English
5.	Dr. G. Ravi	Head, Department of History
6.	Mr. R. Mohan	Head, Department of Mathematics
7.	Dr. N. Prithivikumaran	Head, Department of Physics
8.	Dr. C. Karunakaran	Head, Department of Chemistry
9.	Ms. B. Salocia Fernando Additional Dean Curriculum (Science)	Head, Department of Botany
10.	Dr. K. Nagarajan Dean Curriculum (Science)	Head, Department of Zoology
11.	Dr. T. Kathirvalavakumar	Head, Department of Computer Science
12.	Dr. B. Ravichandran	Head, Department of Commerce
13.	Dr. M. Murugesan	Head, Department of Commerce CA (SF)
14.	Dr. G. Murugesan	Head, Department of Business Administration
15.	Dr. B. Pavala Kumar	Head, Department of Management Studies
16.	Mr. Z. Ramya Sushil	Head, Department of Information Technology
17.	Dr. A. Balasubramanian	Head, Department of Microbiology and B.Voc. Food Safety and Quality

		Management
18.	Mr. D. Rajkumar	Head, Department of Computer Applications
19.	Dr. T. Murugesan	Director of Physical Education
20.	Dr. M. Vigneeswaran	Coordinator – B.Voc. Programme
21.	Lt. Dr. N.Alagumanikumaran	Chairperson - NCC-NME
22.	Dr. M. Meena Devi Dean Curriculum (Arts)	Principal Nominee
23.	Dr. N. Raman	Principal Nominee
24.	Dr. P. Mehalingam	Principal Nominee
25.	Dr. A. Mohini	Principal Nominee
26.	Mr. R. Rajesh, B.E. M.B.A.	Governing Body Nominee
27.	Mr. K.C. Gurusamy, B.Sc.	Governing Body Nominee
28.	Mr. M.A.P.R. Rengasamy, M.Com.	Governing Body Nominee
29.	Dr. H. Shakila Professor, School of Biotechnology, Madurai Kamaraj University Madurai – 625 021.	University Nominee
30.	Dr. M. Bhuvaneshwaran Assistant Professor, Department of Sociology, School of Social Sciences, Madurai Kamaraj University Madurai – 625 021.	University Nominee
31.	Dr. A. Sarathi Dean - Internal Exams	Special Invitee
32.	Dr. P. Sami Dean - Student Services	Special Invitee
33.	Dr. N. Jeyakumaran Dean - Research	Special Invitee
34.	Dr. S. Muthulakshmi Additional Dean Curriculum (Arts)	Special Invitee

14/09/'20

ANNEXURE – I

Annexure – I

Board of Studies – University Nominees

S.No	Name of the Board of Studies	Name & Designation of Experts nominated for the period from 02.03.2020 to 01.03.2022
1	B.Voc. Programme on Environmental Assessment and Remediation	**Dr. S. Kannan** Professor & Head, Chairperson Department of Environmental Studies School of Energy, Environmental and Resources Madurai Kamaraj university Madurai - 625021
2	B.Voc. Programme on Food Safety and Quality Management	**Dr. R. Kannan** Professor , Centre for Tourism & Hotel Management, School of Energy, Environmental and Resources Madurai Kamaraj university Madurai - 625021
3	B.Voc. Programme on Renewable Energy	**Dr. C.Gobinathan** Professor & Head, Department of Solar Energy School of Energy, Environmental and Natural Resources Madurai Kamaraj university Madurai - 625021

ANNEXURE – II

VIRUDHUNAGAR HINDU NADARS' SENTHIKUMARA NADAR COLLEGE
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Course Name : **Bachelor of Arts**
Discipline : **History**
(For those who Join in 2018 and after)

Annexure – II

Semester	Part	Subject	Hours	Credit	Int.+Ext. =Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core 9	**ஐரோப்பிய வரலாறு** (1453 – 1789 A.D)	5	5	25+75=100	U2HSC51	--------	Revised 20%
	Core 10	**அறிவியல் தொழில் நுட்ப வரலாறு**	5	4	25+75=100	U2HSC52	--------	Revised 30%
	Core 11	**வரலாற்று வரைவியலின் அடிப்படை கூறுகள்**	5	4	25+75=100	U2HSC53	--------	Revised 25%
	Core 12	**இந்திய அரசியல் வரலாறு** (1947 AD – 2014)	5	5	25+75=100	U3HSC54	--------	Inter changed 20%
	Elective	**இந்திய அரசியலமைப்பு வரலாறு** (1861 – 1950 A.D)	6	5	25+75=100	U2HSE51	--------	Revised 20%
	SBE – 4	பணிவாய்ப்புத் திறன்	2	2	25+75=100	U1PS51	--------	No Change
	NME- 1	**நவீன இந்தியாவை உருவாக்கிய சிற்பிகள்**	2	2	25+75=100	U2HSN51	--------	New

Semester	Part	Subject	Hours	Credit	Int.+Ext. =Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
VI	Core 13	**ஐரோப்பிய வரலாறு** (1789 - 1945 A.D.)	6	5	25+75=100	U2HSC61	--------	Revised 10%
	Core 14	**பன்னாட்டு உறவுகள்** (1945 - 2005 A.D.)	6	5	25+75=100	U2HSC62	--------	Revised 5%
	Elective 2	இதழியல்	6	5	25+75=100	U3HSE61	--------	Revised 40%
	Elective 3	**பெண்ணியல்**	6	5	25+75=100	U3HSE62	--------	Revised 30%
	SBE - 5	**தற்கால அரசியல் சிந்தனைகள்**	2	2	25+75=100	U2HSS61	--------	Revised 5%
	SBE - 6	ஆய்வு கட்டுரை	2	2	25+75=100	U1HS6PR	Skill	New
	NME - 2	**தற்கால தமிழ்நாட்டு வரலாறு** (1916-2001 AD)	2	2	25+75=100	U2HSN61	--------	Revised 15%

ஐந்தாம் பருவம்

ஐரோப்பிய வரலாறு *(1453-1789 A.D)*

Contact Hours per Semester: - 75 **Subject Code: U2HSC51**
Hours per week: 5 **Credits: 5**

கற்றல் விளைவுகள்

- புவியியல் கண்டுபிடிப்புகளின் முக்கியத்துவத்தை மாணவர்கள் உணர்ந்து கொள்ளுதல்.
- சமயசீர்திருத்த இயக்கங்களின் பணிகளை தெரிந்து கொள்ளுதல்
- ஏதேச்சதிகார வல்லாட்சியாளர்களின் ஆட்சிதிறனை புரிந்து கொள்ளுதல்.

அலகு 1: (15 மணி நேரம்)

இடைக்கால இறுதியில் ஐரோப்பா - புவியியல் கண்டுபிடிப்புகளுக்கான காரணங்கள்- பர்த்தலோமியாடயஸ் – வாஸ்கோடகாமா- கிறிஸ்டோபர் கொலம்பஸ் – பெர்டிணாண்டு மெகல்லன்- விளைவுகள்

அலகு 2: (15 மணி நேரம்)

மறுமலர்ச்சிக்கான காரணங்கள்-இத்தாலியில் மறுமலர்ச்சி ஏற்படுவதற்கான காரணங்கள்-பெட்ராக்-பொக்காஸியோ-மாக்கியவல்லி-லியானர்டோடா வின்ஸி – மைக்கேல் ஆஞ்சலோ- விளைவுகள்.

அலகு 3: (15 மணி நேரம்)

சமய சீர்சிருத்த இயக்கம் தோன்றுவதற்கான காரணங்கள் – ஜெர்மனியில் சமய சீர்திருத்த இயக்கம்- ஸ்விட்சர்லாந்தில் சமய சீர்திருத்த இயக்கம்- இங்கிலாந்தில் சமயசீர்திருத்த இயக்கம் – விளைவுகள் –சமய சீர்திருத்த மறுப்பு இயக்கம்- முப்பதாண்டுப்போர்.

அலகு 4: (15 மணி நேரம்)

பதினான்காம்லூயியின் உள்நாட்டு கொள்கை- வெளிநாட்டு கொள்கை – மகாபிரடரிக் - உள்நாட்டு கொள்கை – வெளிநாட்டு கொள்கை

அலகு 5: (15 மணி நேரம்)

ஆஸ்திரிய வாரிசுரிமை போர்-மரியதெரசா-இரண்டாம் ஜோசப்பின் சீர்திருத்தங்கள்-மகாபீட்டரின் சீர்திருத்தங்கள் –வெளிநாட்டு கொள்கை-இரண்டாம் கேதரினின் சீர்திருத்தங்கள்-வெளிநாட்டு கொள்கை.

நூற்பட்டியல்:

1) T.S. ராமலிங்கம் – ஐரோப்பிய வரலாறு (1453-1789)
2) ஜெயபாலன் – ஐரோப்பிய வரலாறு (1453-1789)
3) J.தர்மராஜ் – ஐரோப்பிய வரலாறு (1453-1789)

Book for Reference:

1) L.Mukherjee-A Study of European History(1453-1815)
2) K.L.Khurana- Modern Europe (1453-1789)
3) K.Dharmarajan-History of Europe (1453-1789)

அறிவியல் தொழில் நுட்ப வரலாறு

Contact Hours per Semester: - 75 **Credits: 4**
Hours per week: 5 **Subject Code: U2HSC52**

கற்றல் விளைவுகள்

1. வானவியல் மற்றும் அறிவியல் முக்கியத்துவம் பற்றி மாணவர்களுக்கு விளக்குதல்
2. தொழில் துறை கண்டுபிடிப்புகள் மற்றும் வளர்ச்சி பற்றி மாணவர்கள் புரிந்து கொள்ளச் செய்தல்.
3. நவீன இந்தியாவின் அறிவியல் மற்றும் தொழில்துறை கண்டுபிடிப்புகளை மாணவர்களுக்கு எடுத்துக் கூறுதல்.

அலகு -1 (15 மணி நேரம்)

வானவியிலில் ஏற்பட்ட வளர்ச்சி – நிக்கோலஸ்கோபர்நிக்கஸ் – கலிலியோ- மருத்துவத்துறையில் ஏற்பட்ட வளர்ச்சி – ஆண்டரியஸ் வெஸாலியஸ் – தொழில் நுட்ப இயலில் ஏற்பட்ட வளர்ச்சி –ஜோகன் கூட்டன் பர்க் – லியோனர்டோடாவின்சி.

அலகு -2 (15 மணி நேரம்)

17- ம் நூற்றாண்டில் அறிவியல் தொழில் நுட்ப வளர்ச்சி ஐசக்நீயூட்டன் – வேதியியல்: ராபர்ட் பாயில் - மருத்துவம்: வில்லியம் ஹார்வி – மார்சலோ மால்பிகி.

18-ம் நூற்றாண்டில் அறிவியல் கண்டுபிடிப்புகள் : நுற்பு மற்றும் நெசவுத்தொழில்- நீராவி இன்ஜின்- வேதியியல் துறையில் வளர்ச்சி:- ஹென்றி கேவண்டிஸ் – லாவாசியா மருத்துவதுறையில் வளர்ச்சி : எட்வர்ட் ஜென்னர்.

அலகு-3 (15 மணி நேரம்)

19-ம் நூற்றாண்டில் அறிவியல் தொழில் நுட்ப வளர்ச்சி: சார்லஸ் டார்வின் – மைக் கேல் பாரடே – வேதியியல் துறையில் வளர்ச்சி: – ஜான்டால்டன் – மெண்டலீப் – மருத்துவத்துறையில் வளர்ச்சி: லூயிபாஸ்டர் – வெடிமருந்து கண்டுபிடிப்பு – செய்தித்

தொடர்பின் வளர்ச்சி: ஆல்பிரட் நோபல் - சாமுவேல் மோர்ஸ் – அலெக்சாந்தர் கிரகாம் பெல் – தாமஸ் ஆல்வா எடிசன்.

அலகு -4 (15 மணி நேரம்)

இருபதாம் நூற்றாண்டில் அறிவியல் தொழில் நுட்ப வளர்ச்சி: ஆல்பர்ட் ஐண்ஸ்டீன் – ராண்ட்ஜென் – மேரிகியூரி - ரூதர்போர்டு – தகவல் செய்தித்தொடர்பில் வளர்ச்சி – மார்க் கோனி – தொலைக்காட்சி- கம்ப்யூட்டர்- செல்போன்.

அலகு -5 (15மணி நேரம்)

நவீன இந்தியாவில் தொழில்நுட்ப வளர்ச்சி – விண்வெளி ஆய்வு – அணுசக்திக்கழகம்- பசுமைப்புரட்சி – இந்தியாவின் முன்னோடி அறிவியலறிஞர்கள் – ஜெகதிச சந்திரபோஸ் - பிரபுல்ல சந்திரராய் – சீனிவாச ராமானுஜம் – சர்.சி.வி.இராமன் – ஹோமிஜஹாங்கிர் பாபா- M.S.சுவாமி நாதன் – அப்துல்கலாம்.

நூற்பட்டியல் :

1. கோமதிநாயகம்- அறிவியல் தொழில் நுட்ப வரலாறு
2. வைரவேல் - அறிவியல் தொழில் நுட்ப வரலாறு
3. J.தர்மராஜ் – அறிவியல் தொழில் நுட்ப வரலாறு

Book For Reference:

1. Also A.D. : The evolution of Scientific that from newton to Einstein
2. Forles : Studies in ancient Technology
3. Philip Leonard Stafford : Great men of Science
4. Ray spangenturg and diane K. Moser: The History of Science volumes
5. Varghese Jeyaraj : History of Science and Technology.

வரலாற்று வரைவியலின் அடிப்படை கூறுகள்

Contact Hours per Semester: - 75 **Credits: 4**
Hours per week: 5 **Subject Code: U2HSC53**

கற்றல் விளைவுகள்

1. வரலாற்றின் பயன்களை உணர்ந்து கொள்ளுதல்
2. காலந்தோறும் வரலாறு எழுதும் முறை மாறி வருவதை புரிந்து கொள்ளுதல்
3. வரலாற்றாய்வு எவ்வாறு செய்ய வேண்டும் என தெரிந்து கொள்ளுதல்.

அலகு 1 (15 மணி நேரம்)

வரலாறு மற்றும் வரலாற்று வரைவியலின் பொருள் விளக்கம் – தன்மை- வரலாற்றின் எல்லை – வரையறையும் நோக்கமும் – வரலாற்றின் வகைகள் - வரலாறும் அதன் தொடர்புடைய பாடங்களும் : அரசியல்- அறிவியல் – புவியியல் – பொருளாதாரம் – இலக்கியம்.

அலகு 2 (15 மணி நேரம்)

வரலாறு கலையா அல்லது அறிவியலா – கலை என்பதற்கான காரணங்கள் – அறிவியல் என்பதற்கான காரணங்கள் – வரலாற்றின் காரண காரிய தொடர்புகள் – வரலாற்றின் படிப்பினைகள் - வரலாற்றின் பயன்களும் கெடுபயன்களும் .

அலகு 3 (15 மணி நேரம்)

வெளி நாட்டு வரலாற்றாளர்களும் அவர்களின் பங்களிப்பும்: ஹெரோடோட்டஸ் – தூசிடைடஸ் – எட்வர்ட்கிப்பன் – கார்ல்மார்க்ஸ் – டாயண்பி

அலகு 4 (15 மணி நேரம்)

இந்திய வரலாற்றாளர்களும் அவர்களின் பங்களிப்பும் : கல்கணர் – அபுல் பாசல் – ஐடுநாத்சர்க்கார் – ரொமில்லா தாபர் T.T.கோசாம்பி - நீலகண்ட சாஸ்திரி – ராஜய்யன் – ரணஜித்குகா

அலகு 5 (15 மணி நேரம்)

வரலாற்றாய்வு – ஆய்வாளருக்குரிய தகுதிகள் – ஆய்விற்கான தலைப்பினை தேர்ந்தெடுத்தல் – சான்றுகளை சேகரித்தல் - நடுநிலை நோக்கு – திறனாய்வு – ஒருங்கி ணைத்தல் – ஆய்வு கட்டுரையாக்கத்தின் படி நிலைகள் – அடிக்குறிப்புகள் - நூற்பட்டியல்

நூற்பட்டியல்:

1. ராஜய்யன் – வரலாற்று கோட்பாடும் முறையியலும்
2. வெங்கடேசன் – வரலாற்று வரைவியல்
3. கணபதி- வரலாற்று வரைவியல்

4. தங்கசாமி – வரலாற்று வரைவியல்
5. தர்மராஜ் – வரலாற்று வரைவியல்

Book for reference

1. Sheik Ali ., B – History : Its Theory and method
2. Rajayyan., K – History in Theory and method
3. Venkatesan., G – A study of Historiography

Core – 12 – **இந்திய அரசியல் வரலாறு (கி.பி 1947 AD - 2014)**

Contact Hours per Semester: - 75 **Subject Code: U3HSC54**
Hours per week: 5 **Credits: 5**

கற்றல் விளைவுகள்

1) மாணவர்கள் இந்தியாவின் அடிப்படை கொள்கைகள் மற்றும் திட்டங்கள் அறிந்து கொள்கிறார்கள்
2) மாணவர்கள் இந்தியாவில் நடைபெற்ற முக்கிய நிகழ்ச்சிகள் மற்றும் சம்பவங்களை தெரிந்து கொள்கிறார்கள்
3) இந்தியாவின் பல்வேறு சட்டங்களை புரிந்து கொள்கிறார்கள்

அலகு 1 (15 **மணி நேரம்**)

சுதந்திர இந்தியா– அரசியலமைப்பு உருவாக்கம் – தேசிய சின்னங்கள்- சுதேச சமஸ்தானங்களின் இணைப்பு – மாநிலங்களின் மறுசீரமைப்பு.

அலகு 2 (15 **மணி நேரம்**)

இந்தியாவின் வெளிநாட்டுக் கொள்கை- அணி சேராக் கொள்கை – இந்தியாவும் ஐக்கிய நாடுகள் சபையும் – இந்திய பாக்கிஸ்தான் போர்கள் – இந்திய சீன போர் - இந்தியாவும் சார்க் அமைப்பும் –இந்தியாவும் ஏசியான் அமைப்பும்.

அலகு 3 (15 **மணி நேரம்**)

ஜவஹர்லால் நேரு –புதுச்சேரி இணைப்பு –கோவா இணைப்பு - ஜனநாயகத் தேர்தல்கள் – ஜமீன்தாரி முறை ஒழிப்பு – திட்டக்குழு – அறிவியல் மற்றும் தொழில் நுட்ப வளர்ச்சி – கல்வி வளர்ச்சி –லால்பகதூர் சாஸ்திரியின் ஆட்சி – தாஷ்கண்ட் பிரகடனம்- இந்திரா காந்தியின் ஆட்சி – பங்களாதேஷ் உதயம் – நெருக்கடி கால நடவடிக்கைகள் – இருபது அம்சத் திட்டம் – நீல நட்சத்திர நடவடிக்கை – ஜனதா கட்சியின் ஆட்சி

அலகு 4 (15**மணி நேரம்**)

ராஜிவ் காந்தியின் ஆட்சியில் முக்கிய நிகழ்வுகள் – போபால் விஷவாயு பேரழிவு – கட்சித் தாவல் தடுப்பு சட்டம் –ஷாபானு வழக்கு –முஸ்லீம் பெண்கள் மசோதா – புதிய கல்விக் கொள்கை – பஞ்சாயத்துராஜ் - இலங்கையுடன் உறவு – V.P. சிங்கின்ஆட்சி- மண்டல் அறிக்கை எதிர்ப்பு போராட்டங்கள் –நரசிம்மராவ் ஆட்சி – புதிய பொருளாதாரக் கொள்கை – பாபர் மசூதி இடிப்பு - வாஜ்பாயின் ஆட்சி – பொக்ரான் அணுகுண்டு சோதனை – கார்க்கில் போர் – பொடா சட்டம் - கோத்ரா சம்பவம்.

அலகு 5 (15 **மணி நேரம்**)

மன்மோகன் சிங் ஆட்சியில் முக்கிய நிகழ்வுகள் - மகாத்மா காந்தி தேசிய ஊரக வேலை உறுதி திட்டம்- லிபரான் கமிஷன் அறிக்கை – ஸ்ரீ கிருஷ்ணா கமிஷன் அறிக்கை – தகவல் பெறும் உரிமைச்சட்டம்- லோக்பால் சட்டம் – திட்ட மிட்ட பொருளாதார வளர்ச்சி – தொழிலாளர் கொள்கையும் , நலத்திட்டங்களும்.

நுற்பட்டியல்:

1. க. வெங்கடேசன் : சம கால இந்திய வரலாறு
2. J. தர்மராஜ் : சம கால இந்திய வரலாறு
3. ஆர்.பி. பாரதி : இந்திய வரலாறு காந்திக்கு பிறகு பாகம் 1 & 2

BooK for References:-

1. Bipin Chandra : History of Modern India
2. *Bipan Chandra* and Mridula *Mukherjee*,: India Since Independence

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இந்திய அரசியலமைப்பு வரலாறு (1861-1950 A.D)

Contact Hours per Semester: - 90 **Credits: 5**
Hours per week: 6 **Subject Code: U2HSE51**

கற்றல் விளைவுகள்

1. பிரிட்டிஸ் இந்திய சட்டங்களின் தாக்கம் பற்றி மாணவர்களுக்கு விளக்கிக் கூறுதல்
2. இந்திய அரசியலமைப்பின் முக்கியத்துவம் பற்றி மாணவர்களுக்கு விரிவாக விளக்குதல்.
3. மத்திய, மாநில அரசுகளுக்கிடையிலான உறவு முறைகள் பற்றி மாணவர்களுக்கு விளக்குதல்.

அலகு 1 (20 மணி நேரம்)

1861-ம் ஆண்டு இந்திய கவுன்சில் சட்டம் 1892-ம் ஆண்டு இந்திய கவுன்சில் சட்டம் -1909-ம் ஆண்டு மின்டோ மார்லி சீர்திருத்தச் சட்டம் – மாண்டேகு செம்ஸ்போர்டு சீர்திருத்தச் சட்டம் 1919 – மாகாணத்தில் இரட்டையாட்சி

அலகு 2 (20 மணி நேரம்)

இந்திய அரசிலமைப்பு வளர்ச்சி 1935 முதல் 1950 வரை – 1935 –ம் வருட இந்திய அரசாங்கசட்டம் –1947-ம் ஆண்டு சுதந்திரச்சட்டம்.

அலகு 3 (20 மணி நேரம்)

அரசியலமைப்பு நிர்ணயசபை - இந்திய அரசியலமைப்பின் சிறப்புத்தன்மைகள் – அரசியலமைப்புதிருத்தும் முறை – இந்தியக் கூட்டாச்சி-அடிப்படை உரிமைகள் – அடிப்படைக் கடமைகள் –அரசுக்கொள்கையின் வழிகாட்டு நெறிகள்.

அலகு 4 (15 மணி நேரம்)

மைய அரசு - குடியரசுத்தலைவர் – துணைக்குடியரசுத் தலைவர் – அமைச்சரவை – பிரதம மந்திரி –மாநிலங்கள் சபை – மக்கள் சபை – சட்டமியற்றும் முறை – பாரளுமன்றக் குழுக்கள் – உச்சநீதி மன்றம்- மாநில அரசு – ஆளுநர் – முதல்வர் – மாநில அமைச்சரவை – உயர்நீதிமன்றம்.

அலகு 5 (15 மணி நேரம்)

அரசியல் கட்சிகள் – அரசுப்பணிகள் – செல்வாக்குக் குழுக்கள் –மத்திய அரசுக்கும் மாநில அரசுகளுக்கு மிடையேயான உறவுகள்-நெருக்கடி நிலை – தேர்தல் ஆணையம்.

நூற்பட்டியல்:

1. G.வெங்கடேசன் – இந்திய விடுதலைப்போராட்ட வரலாறு
2. T.S.ராமலிங்கம் – இந்திய வரலாறு (1857-1954)
3. A. சுவாமிநாதன் – இந்திய அரசியலமைப்பு
4. J.தியாகராஜன் – இந்திய வரலாறு (1773-1950)
5. J.தர்மராஜ் – இந்திய அரசியலமைப்பு வரலாறு (1773-1950)
6. S.சிங்கராசன் – இரட்டையாட்சி

Book for Reference

1. Agarwal , A.C., : Constitutional Development and National Movement of India
2. Basu, D.D., : Constitutional Law of India.
3. Kapoor, A.C., : Constitutional History of India.
4. Pylee, M.V., :Constitutional History of India

பருவம் –V பகுதி- திறன் சார் பாடம் – பணிவாய்ப்புத் திறன்

ஒரு வாரத்திற்கான தொடர்பு மணி நேரம் : 2 **பாடக்குறியீடு : U1PS51**

ஒரு பருவத்திற்கான தொடர்பு மணி நேரம் :30 மதிப்பு : 2

நோக்கங்கள்:

பணிவாய்ப்புத்திறனை மேம்படுத்த அளவுசார் இயற்கைத்திறன், பகுத்தாய்தல், மற்றும் பொது அறிவை வளர்த்தல்

அலகு -1 அளவு சார் இயற்கைத் திறன்

சராசரி, சதவிகிதம், லாபம் & நட்டம் , விகிதம் & விகிதாச்சாரம், காலம் &வேலை, காலம் & தொலைவு, கடிகாரம்.

அலகு -2 அளவுசார் இயற்கைத் திறன்

வயது குறித்த புதிர், படகு & நீரோடை, தனிவட்டி, கூட்டு வட்டி, பரப்பளவு , கூட்டுப் பங்காண்மை.

அலகு – 3 பகுத்தாய்தல்

சொல்சார் பகுப்பாய்வு – ஒத்ததன்மை, வகைப்படுத்துதல், வரிசை, குறியீட்டு முறை & குறிநீக்க முறை, ரத்த உறவு, திசை உணர்வு சோதனை.

அலகு- IV பகுத்தாய்தல்

சொல்சார் பகுப்பாய்வு – எண் சோதனை, தரவரிசை இடுதல் & நேர வரிசை சோத னை, எழுத்து சோதனை, தர்க்க வென் வரைபடம்.

அலகு- V பொது அறிவு:

சுருக்கக் குறியீடுகள், தலைப்பெழுத்துச் சொல் , பிரபலங்கள், முக்கிய நாட்கள், தலைநகரங்கள், நாணயங்கள், நூல்கள் அவற்றின் ஆசிரியர்கள், கண்டுபிடிப்புக்கள்.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

நவீன இந்தியாவை உருவாக்கிய சிற்பிகள்

Contact Hours per sem -30 Credits:2
Hours per week -2 Subject Code: U2HSN51
NME-1

கற்றல் விளைவுகள்

1) மாணவர்கள் அரசியல் மற்றும் சமூகத்தில் சாதனைகள் ஆற்ற உத்வேகம் பெறுகிறார்கள்
2) சமய, தத்துவம் மற்றும் இலக்கியத்தினால் மாணவர்களுக்கு பரந்த அறிவு பெறுகிறார்கள்.

3) அறிவியல் தொழில் நுட்ப கல்வியறிவால் போட்டி தேர்வுக்கு மாணவர்கள் தயார்படுத்தபடுகின்றனர்.

அலகு-1

மகாத்மா காந்தி – சத்தியாகிரகம்-அஹிம்சை – சர்வோதயா- உண்மை – சர்தார் வல்லபாய் படேல் – சுதேச சமஸ்தானங்களை ஒருங்கிணைத்தல் – ஜவஹர்லால் நேரு – இந்திய வெளிஉறவு கொள்கை – அணிசேராக்கொள்கை – பஞ்சசீலம் – பொருளாதார திட்டக் குழு- அம்பேத்கார்- அரசியலமைப்பை உருவாக்குதல் – காமராஜர் –கல்விவளர்ச்சி – தொழில் வளர்ச்சி – இந்திரா காந்தி – அவசரகால நிலை பிரகடனம் – 20 அம்ச திட்டம் – ராஜீவ்காந்தி – புதிய கல்வி திட்டம் – தகவல் தொழில் நுட்ப வளர்ச்சி

அலகு-2

சமூக சீர்திருத்த வாதிகள் – ராஜாராம் மோகன்ராய் – பிரம்மசமாஜ் - அகமதுகான் – ஆங்கிலோ- ஓரியண்ட் - ஜோதிபா பூலே – சத்திய சோதக் சமாஜ் – தீண்டாமையை ஒழித்தல் – பெண்கள் கல்வி விதவை மறுமணம் – அயோத்தி தாஸ் பண்டிதர் – பஞ்சமர் மகாஜனசபை – பெரியார் – சுய மரியாதை இயக்கம் – பெண்உரிமைகள் – முத்துலெட்சுமி ரெட்டி- தேவதாசிமுறை ஒழிப்பு – அகில உலக பெண்கள் மாநாடு – வினோபா வோ – பூமிதான இயக்கம்.

அலகு – 3

சமயம் மற்றும் தத்துவம்

விவேகானந்தர் – ராமகிருஷ்ணா மடம் – ஆதி சங்கரர் அத்வைத வேதாந்தா – ஸ்ரீ அரவிந்தோ – அரவிந்தோ ஆசிரமம் – யோக கலை – ரமணமகிரிஷி - அத்வைத நெறிகள் – ஒசோ – தியானம்-பொன்மொழிகள் –விழிப்புணர்வு – தத்துவம் –ஜிடு கிருஷ்ணமூர்த்தி – பிரம்ம ஞானசபை.

அலகு -4

இலக்கியம்

G. சுப்பிரமணிய ஐயர் –இந்து - சுதேசமித்திரன்- மறைமலை அடிகள் – மனித வசியம் – யோகநித்திரை- சுப்பிரமணியபாரதி – பாஞ்சாலிசபதம்- கீதாஞ்சலி – அறிஞர் அண்ணா- ரோமாபுரிராணி, குமரி கோட்டம், ஆரிய மாயை – வேலைகாரி, ஓர் இரவு – சுஜாதா – துப்பறியும் கதை - அறிவியல் கதை – புதினங்கள்.

அலகு 5

அறிவியல் தொழில் நுட்பம்

ஜெகதீஸ் சந்திரபோஸ் – மின் காந்த அலைகள் ஒளிப்பட கோட்பாடு – ரேடியோ அலைகள் – தாவரங்களின் செயலமைப்பு – ஸ்ரீனிவாசா ராமானுசன் - தீட்டாசார்பு – சோல்டினர் மாநிலி C.V. ராமன் – இராமன் விளைவு – கோபி J. பாபா – அணுசக்தி ஆராய்ச்சி நிலையம் – M.S. சுவாமிநாதன் பசுமை புரட்சி – A.P.J. அப்துல்கலாம் – அணு ஆயுத வடிவமைப்பு – விண்வெளி ஆராய்ச்சி - மயில்சாமி அண்ணாதுரை – விண்வெளி திட்டம் சந்திராயன் -1 மற்றும் 2.

நூற்பட்டியல்:

1) இந்திய விடுதலைப் போராட்ட வரலாறு – வெங்கடேசன்-சந்திரபிரபு
2) இந்திய விடுதலைப போராட்ட வரலாறு – தர்மராஜ்
3) இந்தியாவின் சிறப்பு வரலாறு III – R.C. மஜீம்தார்

BOOKS FOR REFERENCE:

1.Bipin Chandra : India's Struggle for Independence, 1857-1947.
2.Majumdar.R.C., : History of Freedom Movement in India Volume 1-3.
3.Rajayyan,K., : Freedom Struggle in India
4.Vengatesan,G., : History of Freedom Struggle in India.

ஆறாம் பருவம்

ஐரோப்பிய வரலாறு (1789-1945 A.D)

Contact Hours per Semester: - 90 **Credits: 5**
Hours per week: 6 **Subject Code: U2HSC61**

நோக்கங்கள் :

- பிரெஞ்சு புரட்சியின் தாக்கம் ஜனநாயகம் தோன்றுவதற்கு எவ்வாறு வழிவகுத்தது என மாணவர்களுக்கு உணர்த்துதல்.
- உலகப்போர்களின் தீமைகளை மாணவர்களுக்கு உணர்த்துதல்

கற்றல் விளைவுகள்

- சுதந்திரம், சமத்துவம், சுகோதரத்துவம் என்ற கருத்தினை உணர்ந்து கொள்ளுதல்
- சர்வாதிகார ஆட்சிமுறை தீங்கானது என தெரிந்து கொள்ளுதல்
- உலகப்போர்களினால் ஏற்பட்ட தீமைகளை உணர்ந்து கொள்ளுதல்

அலகு 1 (20 மணி நேரம்)

பிரெஞ்சுபுரட்சிக்குமுன் ஐரோப்பிய நிலை - பிரெஞ்சுபுரட்சி: காரணங்கள் – தத்துவ ஞானிகளின் பங்கு – போக்கு – பயங்கர ஆட்சி – விளைவுகள் – நெப்போலியன் போனபார்ட் - போர்கள் – கண்டதிட்டம் – உள்நாட்டு சீர்திருத்தங்கள்

அலகு 2 (20 மணி நேரம்)

வியன்னா மாநாடு – புனித உடன்பாடு - ஐரோப்பியக்கூட்டமைப்பு – மெட்டர்னிக் சகாப்தம் – 1830 மற்றும் 1848ம் ஆண்டு புரட்சிகள் – மூன்றாம் நெப்போலியன்

அலகு 3 (15 மணி நேரம்)

இத்தாலிய இணைவு – மாஜினி –கவூர்- ஜெர்மானிய இணைவு – பிஸ்மார்க் – முதல் உலகப்போர் – காரணங்கள் – போக்கு – விளைவுகள் – சர்வதேசசங்கம்.

அலகு 4 (15 மணி நேரம்)

ரஷ்யபுரட்சி:- காரணங்கள் – போக்கு - விளைவுகள் – லெனின் – பொதுவுடமை கொள்கை – துருக்கியின் முஸ்தபா கமால் பாஷா.

அலகு 5 (20மணி நேரம்)

இத்தாலியில் பாசிஸம் – முசோலினி – வெய்மார் குடியரசு - ஜெர்மனியில் நாசிஸம் – ஹிட்லர் – இரண்டாம் உலகப்போர் – காரணங்கள் – போக்கு – விளைவுகள் .

நூற்பட்டியல்

1. T.S.ராமலிங்கம் – ஐரோப்பிய வரலாறு (1789-1945)
2. ஜெயபாலன் – ஐரோப்பிய வரலாறு (1789-1945)
3. J.தர்மராஜ் – ஐரோப்பிய வரலாறு (1789-1945)

Books for reference:

1. Ketelbey, C.D.M. – A History of Modern times from 1789
2. Hayes, C.J.H – contemporary Europe Since 1870
3. Nanda, S.P – History of Modern Europe and Ehe world

பன்னாட்டு உறவுகள் *(1945- 2005 A.D.)*

Contact Hours per Semester: - 90 **Credits: 5**
Hours per week: 6 **Subject Code: U2HSC62**

குறிப்பு :

1. உலக அமைதியை நிலைநாட்டுவதில் ஐக்கிய நாடுகள் சபையின் செயல்பாடுகள் பற்றி மாணவர்களுக்குப் புரிய வைத்தல்
2. பிராந்திய அமைப்புகளின் மூலம் மக்களுக்கு ஏற்படும் பயன்கள் பற்றி மாணவர்களுக்கு தெளிவாக விளக்குதல்
3. இந்திய வெளிநாட்டுக் கொள்கையின் சிறப்பியல்புகள் பற்றி மாணவர்களுக்குப் புரிய வைத்தல்

அலகு 1 (20 மணி நேரம்)

ஐக்கிய நாடுகள் சபையின் தோற்றம் – அமைப்பு - செயல்பாடுகள் – சிறப்பு அமைப்புகள் – சாதனைகள் - கிளை அமைப்புகள் - கூட்டுச்சேராக்கொள்கை

அலகு 2 (20மணி நேரம்)

பனிப்போர் – காரணங்கள் – போக்குகள்- பிராந்திய அமைப்புகள் – நேட்டோ (NATO) - சீட்டோ (SEATO) - சென்டோ (CENTO) - வார்சா ஒப்பந்தம் - பனிப்போரின் விளைவுகள்

அலகு 3 (20மணி நேரம்)

அமெரிக்க நாடுகள் கழக அமைப்பு (OAS) - ஆப்ரிக்க ஒற்றுமைக்கழகம் (OAU) – அரபு கூட்டமைப்பு – ஐரோப்பிய கூட்டுறவு நிறுவனம் (EEC)- சார்க் (SAARC) – பெட்ரோலிய ஏற்றுமதி செய்யும் நாடுகளின் நிறுவனம் (OPEC)

அலகு 4 (15 மணி நேரம்)

மத்திய கிழக்குப் பிரச்சனை – பாலஸ்தீனப்பிரச்சனை – அரபு – இஸ்ரேல் போர்கள் – வளைகுடாப் போர்

அலகு 5 (15 மணி நேரம்)

அமெரிக்கா , இங்கிலாந்து, ரஷ்யா, பிரான்ஸ், சீன நாடுகளின் வெளியுறவுக்கொள்கை – உலக வர்த்தக அமைப்பு

1. J. தியாகராஜன் – பன்னாட்டு உறவுகள்
2. J. தர்மராஜ் – பன்னாட்டு உறவுகள்

Book for Reference

1. palmer and perkins : International Relations power polities and International organizations.
2. Samaksen : Power polities and International Organisation
3. L.N. savastava : International Relations

4. N. Jeyabalan : International Relations

இதழியல்

Contact Hours per sem -75 Credits:5
Hours per week -6 Subject Code : U3HSE61

கற்றல் விளைவுகள்

1. மாணவர்கள் இதழ்களின் தன்மைகள், வளர்ச்சிகள் பற்றி தெரிந்து கொள்கிறார்கள்.
2. மாணவர்கள் பல்வேறு இதழ்களின் நோக்கம் மற்றும் அமைப்பு பற்றி தெரிந்து கொள்கிறார்கள்
3. இதழ் ஆசிரியரின் பணி, பொறுப்பு, மற்றும் சமூகத்தில் இதழியலின் பங்கு பற்றி அறிந்து கொள்கிறார்கள்
4. விடுதலை இயக்கத்திலும்,சமூக சீர்த்திருத்தங்களிலும் இதழியலின் பங்களிப்பினைப் பற்றி மாணவர்கள் தெரிந்து கொள்கிறார்கள்
5. இதழியல் பற்றி தெரிந்து கொள்வதால் மாணவர்களுக்கு வேலை வாய்ப்பு திறன் பெறுகிறார்கள்.

அலகு-1

இதழியல் – பொருள் விளக்கம் – நோக்கங்கள் – பணிகள், கடமைகள் – இந்தியாவில் இதழ்களின் தோற்றம் - வளர்ச்சி – ராஜாராம் மோகன்ராயின் இதழியல் பணிகள் – விடுதலைக்குப் பிறகு இதழியல் வளர்ச்சி

அலகு-2

செய்தித்தாள் நிர்வாக அமைப்பு : ஆசிரியர் பிரிவு – வாணிபப்பிரிவு – புள்ளி விவரப்பகுதி – செய்தி சேகரிப்பவர்களின் தகுதிகள் – உலகச் செய்தி நிறுவனங்கள் – ராயட்டர் – அசோசியேட்பிரஸ் – டாஸ் – இந்தியச் செய்திநிறுவனங்கள் – அசோசியேட் பிரஸ் ஆப் இந்தியா – பிரஸ் டிரஸ்ட் ஆப் இந்தியா – இந்துஸ்தான் சமாச்சார் – ஓரியண்ட் பிரஸ்.

அலகு – 3

இதழாசிரியரின் பணிகள் – பொறுப்புகள் – தலையங்கம்- நூல் இயல்புகள் – அமைப்பு – விளம்பரம் – பத்திரிக்கை சுதந்திரம் – தடைகள் – அரசியல் நிர்ணயச் சட்டம் – மக்களாட்சியில் இதழ்களின் பங்கு

அலகு -4

முக்கியமான பத்திரிக்கை சட்டங்கள் -1832ம் ஆண்டு செய்திதாள் அவசரச்சட்டம் - 1835 ம் ஆண்டு செய்திதாள் பதிவுச் சட்டம் -1857ம் ஆண்டு இதழ்கள் சட்டம் – 1870ம் ஆண்டு சட்டம் -1878ம் ஆண்டு இந்திய மொழி இதழ்கள் சட்டம் – 1908ம் ஆண்டு குற்றத்தூண்டுதல் சட்டம் – 1910ம் ஆண்டு சட்டம் – அலுவலக ரகசிய சட்டம் 1923- இந்திய பீனல் கோடு சட்ட பிரிவுகள் – அவமதிப்புச் சட்டம் – நாடாளுமன்ற நடவடிக் கைச் சட்டம் 1956 –நீதிமன்ற அவமதிப்புச் சட்டம் - 1971 –பத்திரிக்கை புத்தகங்கள் பதிவு சட்டம் –பதிப்புரிமை சட்டம் – பத்திரிக்கை மன்றம் – இந்திய பத்திரிக்கை மன்றம் .

அலகு 5

தமிழ் முன்னோடி இதழாசிரியர்கள் – ஜி சுப்பிரமணிய ஐயர் – s. கஸ்தூரிரங்க ஐயங்கார் - சுப்பிரமணிய சிவா – கல்கி கிருஷ்ணமூத்தி – பாரதியார் – டி.எஸ். சொக்கலிங்கம் – சி.பா.ஆதித்தனார் – பெரியார்- அண்ணா – முக்கிய இதழ்கள்- சுதேசமித்திரன் – தினத்தந்தி – குடியரசு – விடுதலை, ஜனசக்தி.

நூற்பட்டியல்

1) மா.பா. குருசாமி – இதழியல் கலை
2) J. தர்மராஜ் - இதழியல்
3) ஆ.பி. அந்தோணி இராசு – இதழியல் ஒர் அறிமுகம்
4) அ.மா.சாமி – தமிழ் இதழ்கள் தோற்றம் – வளர்ச்சி
5) இரா. கோதண்டபாணி – இதழியல்

Books for Reference:

1. S. Robert – New Journalism
2. Bill kovach – Elements of Journalism
3. Fred Brown – Journalis Ethics

பெண்ணியல்

Contact Hours per sem -75 credits:5
Hours per week -6 subject code : U3HSE62

கற்றல் விளைவுகள்

- சமூகத்தில் பெண்கள் எவ்வாறு அடிமை படுத்தப்பட்டுள்ளார்கள் என உணர்தல்
- பெண்ணுரிமைகளைப் பற்றியும் பெண் ஆளுமைகளைப் பற்றியும் தெரிந்து கொள்ளுதல்

❖ பெண்களை பாதுகாக்கும் சட்டங்களைத் தெரிந்து கொள்ளுதல்.

அலகு-1

பெண்ணியல் கல்வி – பெண்ணியம் – பெண்ணியவாதி – பெண்ணியத்தின் வகைகள் – மிதவாத பெண்ணியம் – தீவிரவாத பெண்ணியம் – மார்க்சிய பெண்ணியம்.

அலகு-2

பெண்களின் சமூகநிலை –சங்ககாலம் – வேதகாலம் - முகலாயர் காலம்- பெண்ணிய அமைப்புகள் – பெண்ணடிமைக்கு காரணமான சமுதாய சீர்கேடுகள் – பெண்கள் வாக்குரிமை போராட்டம்

அலகு – 3

தற்காலத்தில் பெண்கள் சந்திக்கக் கூடிய பிரச்சனைகள் : பாலின வேறுபாடு – பெண் சிசுகொலை பாலியல் தொல்லை – ஈவ்டீசிங் - வரதட்சனை – விவாகரத்து – பணிபுரியும் இடத்தில் சந்திக்கும் பிரச்சனைகள்.

அலகு -4

பெண்ணுரிமை பாதுகாப்புச்சட்டங்கள் – ஐ.நா.சபையும் பெண்ணுரிமையும் பெண்கள் மீதான அனைத்து வகை பாகுபாட்டிற்கு எதிரான உடன்படிக்கைகள் – பெண்ணிய சட்டங்களும் அதனை நடைபெற படுத்துதலில் ஏற்படும் சிக்கல்கள்.

அலகு 5

பெண்களும் மக்கள் தொடர்பு சாதனங்களும் - பெண்களின் மேம்பாட்டுக்கான அரசு திட்டங்கள் – சுய உதவிகுழுக்கள்- பெண்களுக்கான தேசிய ஆணையம்.

நூற்பட்டியல் :

1) பிரேமா – பெண்ணியம்
2) J.தர்மராஜ் – பெண்ணியல்
3) S.பழனிச்சாமி - பெண்கல்வி

Book for Reference:

1) Shilaja Nagendra : Women's Rights
2) Mohini Chaherjee : Feminism and Women Rights Two valumes
3) Krishnammal : Women studies

தற்கால அரசியல் சிந்தனைகள்

Contact Hours per Semester: - 30 **Credits: 2**
Hours per week: 2 **Subject Code: U2HSS61**

கற்றல் விளைவுகள்

1. அரசியல் சிந்தனையாளர்களின் கருத்துக்களால் உலகில் ஏற்பட்ட அரசியல் தாக்கம் பற்றி மாணவர்களிடம் கேட்டறிதல்.
2. ஜனநாயகக் கோட்பாடுகளின் வளர்ச்சி பற்றி மாணவர்களிடம் கேட்டறிதல்
3. நாசிசம் மற்றும் பாகிசத்தின் விளைவுகள் பற்றி மாணவர்களிடம் கேட்டறிதல்.

அலகு 1 **(6 மணி நேரம)**

இறைமை – இறைமையின் இயல்புகள் – தாமஸ்ஹாப்ஸ் – ஜான்லாக் –ஜீன் ஜேக்கஸ் ரூசோ - ரூசோவின் அரசியல் கோட்பாடுகள் – மாண்டஸ்க்யூவின் அரசியல் கருத்துக்கள் – டேவிட்ஹியூம் – எட்மண்ட்பர்க்

அலகு 2 **(6 மணி நேரம்)**

பயனுடைய தத்துவங்கள் – ஜெர்மிபெந்தாம் – ஜேம்ஸ்மில் – ஜான் ஸ்டுவர்ட்மில் – அரசு பற்றிய இலட்சியக் கோட்பாடுகள் – இம்மானுவேல் காண்ட்- ஹெர்பர்ட் ஸ் பென்சர்.

அலகு 3 **(6 மணி நேரம்)**

சமதர்மம் : பொருள் விளக்கம் – வகைகள் – கூட்டுப் பொதுவுடைமைக் கொள்கைகள் – வாணிபக் கழகப் பொதுவுடைமை – தொழிற்சங்கப் பொதுவுடைமை – ஆட்சி குலைந்தநிலைக் கோட்பாடு.

அலகு 4 **(6 மணி நேரம்)**

மக்களாட்சி : பொருள் விளக்கம் – கோட்பாடுகள் – தாராளவாதம் – தேசியம் – பன்னாட்டியல் – ஏகாதிபத்தியம் – பாசிசம் – நாசிசம்.

அலகு 5 **(6 மணி நேரம்)**

பன்மைவாதிகள் - ஹெரால்ட்லாஸ்கி - பெட்ராண்ட்ரசல் – இந்திய அரசியல் சிந்தனையாளர்கள் : மகாத்மா காந்தி – ஜவஹர்லால் நேரு - டாக்டர் அம்பேத்கர் - டாக்டர் இராஜேந்திரபிரசாத்.

நூற்பட்டியல்

1. போ.வள்ளுவன் கிளாரன்சு அரசியல் அமைப்புகள் ஓர் ஓப்பீடு.
2. S.E. ஸ்டிராங் தற்கால – அரசியலமைப்புகள்

3. பெ.நடராசன் – அரசியல் கோட்பாடுகள்
4. சீனிவாசன் சந்திரபோஸ் – அரசியல் சிந்தனை.
5. ஜெ. தர்மராஜ் – தற்கால அரசியல் சிந்தனை.

Book For Reference

1. Amal kumar :Western political thought
2. Bhandari D.R., : History of European political Philosophy.
3. Ebenstein, W: Great Political Thinkers
4. Das.P.G., : History of Political Thought.

ஆய்வு கட்டுரை

SBE:6 Subject Code : U1HS6PR

Contact Hours :30 Credit: 2

கற்றல் விளைவுகள்

1. வரலாற்று ஆய்வு செய்வதற்கு சான்றுகளின் அவசியத்தை உணர்ந்து கொள்ளுதல்
2. வரலாற்றாய்வின் வாயிலாக உண்மை வரலாற்றை தெரிந்து கொள்ளுதல்
3. வரலாற்று ஆய்வுமுறையை முழுமையாக புரிந்து கொள்ளுதல்

வழிகாட்டுதல்கள்:

1. ஆய்வு கட்டுரைக்கு அதிகபட்ச மதிப்பெண் 100
2. ஆய்வுக்கட்டுரையானது உள்மதிப்பீடு மட்டும் செய்யப்படும்
3. மாணவர்களின் ஆய்வுகட்டுரை சமூக, பொருளாதார, அரசியல் அல்லது தனிநபர் வரலாறாகவோ இருக்கலாம்.
4. ஆய்வுகட்டுரையானது தேவையான சான்றுகளுடன் 40 பக்கம் வரை இருக்கலாம் மாணவர்கள் தங்களது ஆய்வுகட்டுரையை தங்களது வழிகாட்டியின் மேற்பார்வையில் செய்திட வேண்டும்.

தற்கால தமிழ்நாட்டு வரலாறு (1916-2001 A.D)

Contact Hours per Semester: - 30 **Credits: 2**
Hours per week: 2 **Subject Code: U2HSN61**

கற்றல் விளைவுகள்

1. மாணவர்கள் அரசியல் நிர்வாகம் மற்றும் ஆட்சி திறமைகளை தெரிந்து கொள்கிறர்கள்.
2. மாணவர்கள் அரசியல் ஆளுமை திறன் பற்றி அறிந்து கொள்கிறார்கள்.

3. மாணவர்களுக்கு சமூக நலத்திட்டங்களை தெரிந்து கொள்ளகிரார்கள்.

அலகு 1 **(6மணி நேரம்)**

நீதிக்கட்சியின் தோற்றம் - ஆட்சி - சாதனைகள் - நீதிக்கட்சியின் வீழ்ச்சிக்கான காரணங்கள்.

அலகு 2 **(6மணி நேரம்)**

பெரியார் - சுயமரியாதை இயக்கம் – தோற்றம் –கொள்கைகள் – சாதி ஒழிப்பு – சுயமரியாதைத் திருமணம் – பெண் விடுதலை- திராவிடர் கழகம்.

அலகு 3 **(6மணி நேரம்)**

சுதந்திரப்போராட்டத்தில் ராஜாஜியின் பங்கு – சென்னை மாகாண முதல மைச்சராக ராஜாஜி – தனிநபர் சத்தியாகிரகத்தில் ராஜாஜி – காந்தியுடன் கருத்து வேறுபாடு – ராஜாஜியின் ஆட்சி.

அலகு 4 **(6மணி நேரம்)**

காமராசரின் அமைச்சரவை – கல்வி வளர்ச்சி – தொழில் வளர்ச்சி – தமிழ் வளர்ச்சி – பக்தவச்சலம் ஆட்சி – திராவிடமுன்னேற்ற கழகம் – ஹிந்தி எதிர்ப்பு போராட்டம் – அண்ணாத்துரை ஆட்சி – சாதனைகள்.

அலகு 5 **(6 மணி நேரம்)**

கருணாநிதி ஆட்சி மற்றும் சாதனைகள் – எம்.ஜி.ராமசந்திரன் ஆட்சி மற்றும் சாதனைகள் – ஜெ. ஜெயலலிதா ஆட்சி மற்றும் சாதனைகள்.

நூற்பட்டியல்

1) மங்கள முருகேசன் – சுயமரியாதை இயக்கம்
2) A. ராமசாமி – என்று முடியும் இந்த மொழிப்போர்?
3) க. வெங்கடேசன் – தற்கால தமிழநாட்டு வரலாறு (1600-2011)
4) A. சுவாமிநாதன் – தமிழக வரலாறு
5) J. தர்மராஜ் – தமிழக வரலாறு

BOOKS FOR REFERENCE:

1.Baker,C.J., : The Politics of South India (1920-1937)
2. Rajaraman.P., : The Justice party
3.Nambi Arroran., : Tamil Renaissance and Dravidian Nationalism (1905-1944)
4. David Arnold., : The Congress in Tamilnadu: Nationalist Politics in South India (1919-1947)

Course Name: **Bachelor of Commerce**
Discipline: **Commerce**
(For those who Join in 2018 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	III	Corporate Accounting	5	4	25 + 75 = 100	U3CMC51	Employability	Name Changed and Revised-30%
	III	Financial Markets and Services	5	4	25 + 75 = 100	U3CMC52	Employability	Revised – 5%
	III	Business Environment	5	4	25 + 75 = 100	U3CMC53	Entrepreneurship	Interchange and Revised – 70%
	III	Business Law	5	4	25 + 75 = 100	U3CMC54	Entrepreneurship	Revised – 40%
	III	Elective – II - Income Tax	6	5	25 + 75 = 100	U3CME51	Employability	Revised – 5%
	IV	SBS – IV – Employability Skills	2	2	25 + 75 = 100	U1PS51	Skill Development	No Change
	IV	NME – I – Business Accounting	2	2	25 + 75 = 100	U2CMN51	Skill Development	No Change

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
VI	III	Management Accounting	6	5	25 + 75 = 100	U3CMC61	Employability	Revised – 5%
	III	Entrepreneurship Development	6	4	25 + 75 = 100	U3CMC62	Employability	New-100%
	III	Special Accounts	6	4	25 + 75 = 100	U3CMC63	Entrepreneurship	New-100%
	III	Financial Management	6	4	25 + 75 = 100	U2CME61	Entrepreneurship and Employability	No Change
	IV	SBS – V – Project	2	2	25 + 75 = 100	U1CM6PR	Skill Development	New-100%
	IV	SBS – VI – LAB: Business Accounting Software	2	2	40 + 60 = 100	U3CMS6P	Employability	Name Changed and Revised-10%
	IV	NME – II – Principles of Marketing	2	2	25 + 75 = 100	U3CMN61	Skill Development	Revised – 5%

B.Com. – V Semester
CORPORATE ACCOUNTING

Hours: 5hrs/week:75 Hrs **Subject Code: U3CMC51**
Credits: 4

Course Outcomes:
Students, after successful completion of the course, will be able to

1. Understand the accounting procedure for Issue of Equity shares, Redemption of Preference Shares and Debentures Issue and Redemption.
2. Gain knowledge on the preparation of Final Accounts of Companies.
3. Acquire capacity to prepare the accounts of Liquidation, Amalgamation and

Absorption of Companies.

UNIT – 1 **(15-hours)**

Shares – Meaning - Kinds of shares - Issue of Shares: At Par, At Premium, At Discount - Forfeiture – Reissue - Underwriting of Shares.

UNIT – 2 **(15-hours)**

Preference Shares - Redemption of Preference Shares - Debentures – Issue – Redemption: ex-interest and cum-interest quotations - Sinking Fund Method.

UNIT – 3 **(15-hours)**

Final Accounts of Companies - Provisions relating to preparation of final accounts (Excluding Calculation of Managerial Remuneration) - Profit Prior to Incorporation.

UNIT – 4 **(15-hours)**

Liquidation of Companies - Statement of Affairs - Deficiency a/c – Liquidators Final Statement of Accounts

UNIT – 5 **(15-hours)**

Amalgamation – Meaning-Types of Amalgamation: Amalgamation in the nature of merger, Amalgamation in nature of purchase – Absorption (Simple problems only)

Note: Distribution of marks - Theory - 20% and Problems - 80%

Text Books

1. Corporate accounting – T.S.Reddy and A.Murthy

Reference Books

1. Advanced accounts – S.P.Jain & K.L.Narang
2. Advanced accountancy – S.N.Maheswari & S.K.Maheswari
3. Advanced accountancy – P.C.Tulsian

FINANCIAL MARKETS AND SERVICES

Hours: 5hrs/week 75 Hrs **Subject Code: U3CMC52**
Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand the concept and functions of financial markets.
2. Gain knowledge on money market and capital market operations.
3. Obtain knowledge on mutual fund and merchant banking concepts.

UNIT – 1 **(15-hours)**

Financial system – meaning – function – financial concepts- financial assets – financial intermediaries – financial markets – financial instruments – classification of financial markets – Development of Financial System in India – strengths and weaknesses of Indian Financial System – SEBI and its role.

UNIT – 2 **(15-hours)**

Money Market – Definition – Features – Objectives – Characteristic features of a developed money market – Importance of money market – composition of money market – Money market instruments - call money market – commercial bills market, Commercial paper – Certificate of Deposits, GDRs and ADRs – Treasury bill market – discount market

UNIT – 3 **(15-hours)**

Capital market – Capital market Vs Money Market - New issue market – New issue market Vs Secondary market – importance of new issue markets – methods of floating new issues – Secondary market – Stock exchange – functions – Listing of securities – Demat and Remat - Registration of stock brokers – methods of trading in stock exchange – defects of Indian capital markets - NSDL & CDSL.

UNIT – 4 **(15-hours)**

Merchant banking – Meaning – service of merchant banks – SEBI Guidelines – Scope for Merchant Banking in India – Factoring: Meaning – Functions – benefits - types – Factoring Vs Discounting – Forfaiting – Factoring Vs Forfaiting.

UNIT – 5 **(15-hours)**

Mutual fund – meaning – importance – risks – classification of funds – Open ended funds – close-ended funds: income funds, Growth funds, and balanced funds, Money Market Mutual fund – tax savings funds – organization of the fund – Net asset value - SEBI Guidelines - AMC

Text Books

1. The Indian Financial System – Vasant Desai
2. Financial Markets and Services – Gordon and Natarajan

Reference Books

1. Indian Financial System – P.N. Varsheney & D.K. Mittal
2. Financial Institutions and Markets – L.M. Bhole
3. Management for Indian Financial Institutions – R.M. Srivastava

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BUSINESS ENVIRONMENT

Hours: 5/week 75 Hrs **Subject Code: U3CMC53**
Credits: 4
Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand micro environmental factors affecting business.
2. Gain knowledge on various macro environmental factors.
3. Acquire capacity to analyze the impact of environmental factors on business practices and policies.

UNIT –1 **(15 Hours)**

Business: Meaning - Characteristics of modern business - Business Environment – Meaning – Features - Environmental analysis – Meaning – Importance – Benefits - Limitations.

UNIT-2 **(15 Hours)**

Components of Business Environment: Micro factors: Internal - Vision – Mission - Organisational structure - Organisation Culture - Organisation Resources – External – customers – suppliers – Dealers - Competitors and Society. Introduction to Macro factors - Social, Cultural, Political and legal, Technology and Economical factors.

UNIT-3 **(15 Hours)**

Economical, Social and Cultural Environments: Economic Environment - Economic System – Economic Condition - Economic Policy - Social Environment - Social responsibility of business - Responsibilities towards shareholders, Customers, community and Government - Cultural Environment: Elements of culture - Impact on Business.

UNIT –4 **(15 Hours)**

Political and Legal Environments: Political Environment: Meaning, factors affecting business. Legal Environment: Meaning – Factors affecting Business – Legal framework in India.

UNIT-5 **(15 Hours)**

Technological and Ecological Environment: Meaning, Elements of Technological Environment – Innovation - Technical Know-how, Technology Transfer - Research and Development. Ecological Environment: Factors - Government control - Legislation- eco-products - Corporate Environmentalism.

Text Books:-

1. Business Environment- Francis Cherunilam
2 .Essentials of Business Environment - K.Aswathappa
3. Business Environment – Dr.V.Alagappan & Dr.K.Chidambaram

Reference Books:-

1. Business and Society – Lokanathan & Lakshmi Ratan
2. Business Environment- Viswajeet Prasad

BUSINESS LAW

Hours: 5hrs/week 75 Hrs **Subject Code: U3CMC54**
Credits: 4
Course Outcomes:

Students, after successful completion of the course, will be able to

1. Identify the fundamental legal principles behind contractual agreements.
2. Gain knowledge on various provisions of the business law.
3. Acquire capacity to understand the implication of business law in practice.

UNIT – 1 **(15 hours)**

Law of contracts: Definition – Nature of contract – Classification of contract - Essential elements of a valid contract – Offer – Types of offer – Essentials of a valid offer - Acceptance – Legal rules of a valid acceptance – Consideration – Essential parts of the consideration – Legal rules for a valid consideration - Capacity of parties.

UNIT – 2 **(15 hours)**

Performance of Contracts: Various modes of discharge of contracts- Breach of contracts- Types - Remedies for breach of contracts - Quasi contracts – Features – Types.

UNIT – 3 **(15 hours)**

Bailment: Definition – Essentials – Rights and duties of bailor and bailee -Bailee's lien– Finder of lost goods – Rights and duties of finder of goods - Discharge of bailment contracts.

UNIT – 4 **(15 hours)**

Sale of goods Act 1930 - Sale and Agreement to sell – Classification of goods – Rights and Duties of buyer – Rights and Duties of Seller – Rights of Unpaid seller – Sale by non-owners - Rules regarding delivery of goods.

UNIT – 5 **(15 hours)**

The Consumer Protection Act, 1986: Definition – Aims - Consumer Protection Council – Consumer disputes – Redressal – Agencies at various levels - District Forum, State Commission - National Commission – Penalties – Reasons for slow growth of consumer movement in India.

The Competition Act, 2002 - definition – Factors which cause adverse effect on competition – competition commission of India – duties, powers and functions of the commission.

Text Book:

1. Elements of Mercantile Law – N.D.Kapoor

Reference Books

1. Business law – R.S.N. Pillai & Bagawathi
2. Business law – S.N. Maheshwari & S.K. Maheshwari.
3. Business Law - D. Chandra Bose.

INCOME TAX

Hours: 6hrs/week 90 Hrs **Subject Code: U3CME51**
Credits: 5
Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand provisions of Income Tax Act.
2. Gain knowledge on residential status and incidence of tax.

3. Acquire capacity to compute income from various heads and tax liability.

UNIT – 1 **(18-hours)**

Income Tax Act, 1961 – Definition – Income – Assessment – Assessment Year – Previous Year – Person – Assessee –Types of assessee– Residential status – Deemed income – Exempted Incomes U/s 10

UNIT – 2 **(18-hours)**

Income from Salary - meaning – Allowances - Taxable, Special and Exempted, Perquisites - Accommodation, Motor car and Leave Travel Allowance – Profit in lieu of salary.

Income from House property – GAV, NAV, Interest on loan - Computation of income from Self Occupied and let out properties.

UNIT – 3 **(18-hours)**

Profits and Gains from Business or Profession – Depreciation, allowable and disallowable deductions

UNIT – 4 **(18-hours)**

Capital gains – Short Term and Long Term - Income from Other Sources

UNIT – 5 **(18-hours)**

Clubbing of Income – Set-off and Carry forward of Losses – Deductions from Gross Total Income- Sec 80C, 80D, 80DD, 80E, 80G, 80TTA, 80U.

Note: Distribution of marks - Theory - 40% and Problems - 60%

Text Book

1. Income Tax Law and Practice – T.S.Reddy and A.Murthy

Reference Books

1. Income Tax Law and Practice – Bhagavathi Prasad
2. Students Guide to Income Tax – Vinod K. Singhania
3. Income Tax Law and Practice – H.C. Mahrotra
4. Income Tax Law and Practice – V.P. Gaur and D.B. Narang

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**
Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock.

(6-hours)

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**

Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**

Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**

General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME: BUSINESS ACCOUNTING

Hours: 2hrs/week 30 Hrs **Subject Code: U2CMN51**
Credits: 2

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand basic principles of book-keeping.
2. Gain knowledge on the preparation of journal.
3. Acquire capacity to prepare subsidiary books and final accounts.

UNIT – 1 **(6 hours)**

Introduction – Book keeping – Accountancy – Double entry system – Classification of accounts – Rules – Scope, Advantages and limitations of Double entry system

UNIT – 2 **(6 hours)**

Books of original entry – Journal – Ruling of journal book – Advantages of Journal

UNIT – 3 **(6 hours)**

Subsidiary books – Purpose – single and double column cash book– Purchase, sales and their returns books

UNIT – 4 **(6 hours)**

Ledgers – posting – purpose – ruling and balancing of the ledger account –preparation of Trial Balance from the given balances

UNIT – 5 **(6 hours)**

Final accounts of sole trading concerns with simple adjustments namely closing stock, outstanding expense, accrued income, depreciation.

Note: Distribution of marks - Theory - 40% and Problems - 60%

Text Books
1. Advanced Accountancy – T.S. Reddy and A. Murthy
2. Financial accounting – R.S.N. Pillai & Bagawathi

Reference Books
1. Advanced accounts – M.C. Shukla and T.S. Grewal
2. Principles and practice of accounting – R.L. Gupta and V.K. Gupta

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B.Com. VI Semester

MANAGEMENT ACCOUNTING

Hours: 6hrs/week 90 Hrs **Subject code: U3CMC61**
Credits: 5

Course Outcomes:
Students, after successful completion of the course, will be able to
1. Understand the basic concepts of management accounting.
2. Get clear knowledge about the preparation of various types of budgets.
3. Gain knowledge on concepts of marginal costing.

UNIT – 1 **(18 hours)**

Management accounting – meaning – definitions – characteristics – scope – objectives and functions – distinction between financial accounting and management accounting – distinction between management accounting and cost accounting – tools and techniques of management accounting – advantages and limitations.

UNIT – 2 **(18 hours)**

Ratio analysis – meaning – advantages – limitations – classification of ratios – computation of profitability ratios – turnover ratios – solvency ratios.

UNIT – 3 **(18 hours)**

Cash flow statement – meaning, importance and limitations - Calculation of cash from operations – Preparation of cash flow statement (indirect method only) as per Ind AS 7 – operating activities, financing activities and investment activities (simple problems only).

UNIT – 4 **(18 hours)**

Marginal costing – meaning, assumptions, advantages and limitations - Break even analysis – PV ratio – Margin of safety (Excluding the application of marginal costing for managerial decisions)

UNIT – 5 **(18 hours)**

Budgeting and budgetary control – meaning – objectives – advantages – limitations – essentials of successful budgetary control – classification of budget – preparation of sales budget, production budget, purchase budget, cash budget and flexible budget.

Note: Distribution of marks - Theory - 20% and Problems - 80%

Text Books

1. Management Accounting – R.S.N. Pillai & Bhavathi
2. Management Accounting – T.S. Reddy & Y. Hari Prasad Reddy

Reference Books

1. Management Accounting – M.Y. Khan and P.K. Jain
2. Management Accounting – S.N. Maheswari

ENTREPRENEURSHIP DEVELOPMENT

Hours: 6 hrs/week 90 Hrs **Subject Code: U3CMC62**
Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Gain knowledge on the concept of entrepreneurship.
2. Understand the steps in entrepreneurship building.
3. Prepare project reports.

UNIT – 1 **(18 Hours)**

Entrepreneurship: meaning, definition and importance – role of entrepreneurship in the process of economic development – entrepreneur vs manager. Factors affecting entrepreneurship growth: economic, social, cultural, personality, psychological and sociological factors.

UNIT – 2 **(18 Hours)**

Entrepreneurship Competencies: – Meaning, components: knowledge, skill, traits and motives – Qualities of entrepreneurs – types of entrepreneurs – functions of entrepreneurs – entrepreneurship culture

UNIT – 3 **(18 Hours)**

Enterprise building (Starting of a new enterprise): – Steps in enterprise building: New business idea – preliminary evaluation – project formulation – preparation of project report – project appraisal – financial analysis – profitability analysis – social cost benefit analysis – implementation of enterprise building – Business and Industrial Visit.

UNIT – 4 **(18 Hours)**

Entrepreneurship development institutions in India: NAYE, SIPCOT, TIDCO, SISI, DIC - MSME – Definition – Registration - Agencies supporting MSME - Government Assistance: Concession and subsidies.

UNIT – 5 **(18 Hours)**

Women Entrepreneurs: Concept of women entrepreneurship – functions and role of

women entrepreneurs – growth of women entrepreneurship in India – recent trends in development of women entrepreneurs–Government Assistance for Women entrepreneurs – Problems of women entrepreneurs.

TEXT BOOKS

1. C.B. Gupta - Entrepreneurship development
2. S.S. Khanka - Entrepreneurial development.
3. E. Gorden & Natarajan – Entrepreneurship Development

REFERENCE BOOKS

1. Vasanth Desai – Entrepreneurship Development - Himalaya Publication, New Delhi.
2. Desh Pande M.U. – Entrepreneurship of small scale industries concept, growth management, Deep and Deep Publications
3. Jose Paul N. Ajith Kumar – Entrepreneurship development Himalaya pub., New Delhi

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SPECIAL ACCOUNTS

Hours: 6hrs/week 90 Hrs **Subject Code: U3CMC63**
Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand the accounting procedure for Holding Company Account.
2. Gain knowledge on the preparation of accounts for Banking and Insurance Company.
3. Acquire capacity to prepare the accounts for various public utility concerns.

UNIT – 1 **(18 Hours)**

Holding Company Accounts - Preparation of Consolidated Balance Sheets with treatment of inter-company Owings, Unrealized Profit, Bonus issue (Inter Company Holdings excluded).

UNIT – 2 **(18 Hours)**

Banking Company Accounts – Rebate on Bills Discounted - Preparation of Profit and Loss Account and Balance Sheet (New format only)

UNIT – 3 **(18 Hours)**

Insurance Company accounts: Life Insurance and General Insurance- Final accounts and schedules (New format only)

UNIT – 4 **(18 Hours)**

Final of Accounts of public utility concerns - Electricity Companies, Railways – Replacement of an asset (Excluding Disposal of surplus).

UNIT – 5 **(18 Hours)**

Indian Accounting Standards: Meaning – Scope – Objectives - Advantages – Disadvantages - Framework for Preparation and Presentation of Financial Statements in accordance with Indian Accounting Standards (Theory only).

Note: Distribution of marks - Theory - 20% and Problems - 80%

Text Books

1. Corporate accounting – T.S. Reddy and A. Murthy

Reference Books

1. Advanced accounts – S.P. Jain & K.L. Narang
2. Advanced accountancy – S.N. Maheswari & S.K. Maheswari
3. Advanced accountancy – P.C. Tulsian

FINANCIAL MANAGEMENT

Hours: 6 Hrs / Week 90 Hrs **Subject code: U2CME61**
Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand the basic concepts of financial management.
2. Get clear knowledge about the preparation capital budget and working capital statement.
3. Gain knowledge on concepts of dividend policy.

UNIT – 1 **(18 Hours)**

Financial management – Meaning – Nature – Scope – Objectives – Profit maximization Vs Wealth maximization - Finance functions - Role and Responsibilities of a finance manager

UNIT – II **(18 Hours)**

Financing Decisions – Capital structure – optimum capital structure - Determinants of capital structure – Theories of capital Structure – Leverages – types – Financial leverages – Operating leverages – Combined leverages.

UNIT – III **(18 Hours)**

Investment decisions – capital budgeting – Appraisal methods – payback period – Average rate of return – Discounted methods – Net present value – Internal rate of return – Profitability index.

UNIT – IV **(18 Hours)**

Working capital – Meaning – Types – Need and Influencing Factors – Estimation of working capital requirements

UNIT – V **(18 Hours)**

Dividend policy – Dividend policy decision - Stability of dividend - Forms of dividend – Determinants of Dividend policy - Dividend theories – Modigliani and Miller's approach – Walter's approach –Gordon's approach.

Note: Distribution of marks - Theory - 40% and Problems - 60%

Text Books
1. Financial Management – S.N. Maheswari
2. Financial Management – M.Y. Khan and P.K. Jain

Reference Books
1. Financial Management – I.M. Pandey
2. Financial Management – S.C. Kuchal
3. Financial Management – Prasanna Chandra

PROJECT WORK

Hours: 2 hrs/week 30 Hrs **Subject Code: U1CM6PR**
Credits:2

Course outcomes:
Students, after successful completion of the course, will be able to
1. Gain knowledge on analysing the business problems.
2. Understand the methodology of report writing.
3. Write project reports.

PROJECT TOPIC:
Any Commerce and industry related topics.

GUIDELINES:
1. Combined project of 5 students each.
2. Project report should be typed in A4 size paper with a minimum of 30 pages.
3. Format: Font – Times New Roman, Size – 12, Single side typing, Double line spacing.
4. Binding – Spiral binding.

Evaluation: Internal evaluation only - Project – 50 marks; Viva-voce – 50 marks

THE COMPONENTS OF A PROJECT REPORT
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Student's Declaration
3) Supervisor's Certificate
4) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
5) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
6*)* Body of the Report: The body of the report should have these four logical divisions
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires/Interview schedule (if any), relevant reports, etc.

LAB: BUSINESS ACCOUNTING SOFTWARE

Hours: 2hrs/week 30 Hrs **Subject Code: U3CMS6P**
Credits: 2
Course Outcomes:
Students, after successful completion of the course, will be able to

1. Understand the basic concepts of Tally.
2. Get clear knowledge about the preparation of various types of Vouchers.
3. Acquire capacity to prepare the sales invoices with GST Calculation.

List of Programs

1. Create a new company with ledger creation including opening balance.
2. Prepare journal entries and display the Day book, Trial Balance and Final accounts.
3. Prepare final accounts with the adjustments for :
    a. Closing stock
    b. Outstanding Expenses
    c. Prepaid expenses
    d. Depreciation
    e. Income received in advance
    f. Interest on capital
    g. Interest on drawings
4. Create a cost centre and cost category.
5. Creation of stock group, stock item and units of measure.
6. Create Inventory vouchers.
7. New Voucher Creation.
8. Make sales and purchase invoice with GST Calculation.
9. Submission of GST returns.
10. Demonstrate Restore and Data Backup.

NME: PRINCIPLES OF MARKETING

Hours: 2 hrs/ week 30 hrs **Subject Code: U3CMN61**
Credits: 4

Course Outcomes:
Students, after successful completion of the course, will be able to

1. Gain knowledge on basic principles of marketing.
2. Understand the components of marketing mix.
3. Obtain information on the pricing policies and promotional tools.

UNIT-1 **(6 Hours)**

Marketing – Definition, meaning – types – Importance - Functions.

UNIT –2 **(6 Hours)**

Product - Types-New Product Development - Product Life Cycle.

UNIT –3 **(6 Hours)**

Pricing-Objectives — Determinants of Price - Methods of Pricing

UNIT- 4 **(6 Hours)**

Physical Distribution - Types of Channels - Selection of Channel.

UNIT – 5 **(6 Hours)**

Promotion-Advertising – Advertising media - Personal selling, Sales promotion - Types, Distinction between advertising and Personal selling.

Text Books:-

1. Principles of Marketing – R.S.N. Pillai
2. Principles of Marketing – Rajan Nair

Reference Books

1. Marketing – Philip Kotler
2. Marketing Management – C.B. Memoria

Course Name: **Bachelor of Commerce**
Discipline: **Commerce**

Value Added Course:

Subject	Int =Tot	Subject Code
Financial Accounting Using Accounting Software	100=100	V1CM9

VALUE ADDED COURSE

FINANCIAL ACCOUNTING USING ACCOUNTING SOFTWARE

Hours: 30 Hrs **Subject code: V1CM9**
Credits:

Course Outcomes:
Students, after successful completion of the course, will be able to
1. Understand the basic concepts of Tally.
2. Get clear knowledge about the preparation of various types of Vouchers.
3. Acquire capacity to prepare the sales invoices with GST Calculation.

UNIT – 1 **(6 Hours)**

Basic concepts of Accounting - Company Creation, Modification & other entries – Journal entries & creation/modification etc.

UNIT – 2 **(6 Hours)**

Ledger Creation - Group Creation - Preparation of Vouchers- (Payment, Receipt, Journal, Contra, Purchase, Sales Voucher) - Preparation of Vouchers Type.

UNIT – 3 **(6 Hours)**

Preparation of Trading Account, Profit & Loss Account, Balance Sheet.

UNIT – 4 **(6 Hours)**

Stock Management- Stock Group Creation, Stock category, Godown maintenance, Units of measurement creation, Stock ledger creation & maintenance etc.

UNIT – 5 **(6 Hours)**

Goods & Services Tax (GST)- Overview –Dealers types – HSN code/SAC code - Supply under GST, Charge of GST, Composition Levy, Tax Calculation- Computation of GST Liability, Tax Invoice, Tax Payment, Return filling, Exemptions etc.

Text Books :
1. Dr.Namrata Agarwal, Tally 9, Comdex

Reference Books :
1. Learn Tally. ERP 9 Computerized Accounting Made Easy

2. Tally.ERP 9 in simple steps.

Course Name: **Bachelor of Commerce**
Discipline: **Commerce with Computer Applications**
(For those who Join in 2018 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	III	Corporate Accounting	5	5	25 + 75 = 100	U3CCC51	Employability	Name Changed and Revised- 30%
	III	Java Programming	5	4	25 + 75 = 100	U2CCC52	Employability	No Change
	III	LAB: Java Programming	5	4	40 + 60 = 100	U2CCC5P	Skill Development	No Change
	III	Business Law	5	4	25 + 75 = 100	U3CCC53	Entrepreneurship	Revised – 40%
	III	Elective – II - Income Tax	6	5	25 + 75 = 100	U3CCE51	Employability	Revised – 5%
	IV	SBS – IV – Employability Skills	2	2	25 + 75 = 100	U1PS51	Skill Development	No Change
	IV	NME – I – Business Accounting	2	2	25 + 75 = 100	U2CCN51	Skill Development	No Change

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
VI	III	Management Accounting	6	5	25 + 75 = 100	U3CCC61	Employability	Revised – 5%
	III	Internet and Web Technologies	6	4	25 + 75 = 100	U2CCC62	Employability	No Change
	III	Special Accounts	6	4	25 + 75 = 100	U3CCC63	Employability	New-100%
	III	LAB: Web Design	6	4	40 + 60 = 100	U2CCC6P	Skill Development	No Change
	IV	SBS – V – Project	2	2	25 + 75 = 100	U1CC6PR	Skill Development	New-100%
	IV	SBS – VI – LAB: Business Accounting Software	2	2	40 + 60 = 100	U3CCS6P	Employability	Name Changed and Revised- 10%
	IV	NME – II – Principles of Marketing	2	2	25 + 75 = 100	U3CCN61	Skill Development	Revised – 10%

B.Com. – V Semester

CORPORATE ACCOUNTING

Hours: 5hrs/week 75 Hrs **Subject Code: U3CCC51**
Credits: 4

Course Outcomes:
Students, after successful completion of the course, will be able to

1. Understand the accounting procedure for Issue of Equity shares, Redemption of Preference Shares and Debentures Issue and Redemption.
2. Gain knowledge on the preparation of Final Accounts of Companies.
3. Acquire capacity to prepare the accounts of Liquidation, Amalgamation and Absorption of Companies.

UNIT – 1 **(15-hours)**

Shares – Meaning - Kinds of shares - Issue of Shares: At Par, At Premium, At Discount - Forfeiture – Reissue - Underwriting of Shares.

UNIT – 2 **(15-hours)**

Preference Shares - Redemption of Preference Shares - Debentures – Issue – Redemption: ex-interest and cum-interest quotations - Sinking Fund Method.

UNIT – 3 **(15-hours)**

Final Accounts of Companies - Provisions relating to preparation of final accounts (Excluding Calculation of Managerial Remuneration) - Profit Prior to Incorporation.

UNIT – 4 **(15-hours)**

Liquidation of Companies - Statement of Affairs - Deficiency a/c – Liquidators Final Statement of Accounts

UNIT – 5 **(15-hours)**

Amalgamation – Meaning - Types of Amalgamation: Amalgamation in the nature of merger, Amalgamation in nature of purchase – Absorption (Simple problems only)

Note: Distribution of marks - Theory - 20% and Problems - 80%

Text Books

1. Corporate accounting – T.S. Reddy and A. Murthy

Reference Books

1. Advanced accounts – S.P. Jain & K.L. Narang
2. Advanced accountancy – S.N. Maheswari & S.K. Maheswari
3. Advanced accountancy – P.C. Tulsian

JAVA PROGRAMMING

Hours: 5hrs/week 75 Hrs **Sub. Code: U2CCC52**
Credits: 5
Course Outcomes:
Students, after successful completion of the course, will be able to

1. Understand the use of OOPS Concepts.
2. Understand the use of Packages and Interfaces in Java.
3. Design GUI based applications and develop applets for web applications.

UNIT – 1 **(15-hours)**

An overview of Java - Object oriented programming – Java features – Simple Java program – Java Program Structure – Java Tokens – Constants, Variables and Data types – Operators and Expressions.

UNIT – 2 **(15-hours)**

Control Statements - Decision Making and branching: Simple if – if…Else – Nesting of if…Else – Else if Ladder – Switch – Decision Making and Looping: While – Do – For. Jump Statements: break – continue. Arrays: one dimensional and two dimensional Arrays

UNIT – 3 **(15-hours)**

Classes and Objects - Classes, Objects and Methods: Defining a Class – Fields and Methods Declaration – Creating Objects – Accessing Class Members – Method Overloading – Nesting of Methods – Constructors – Inheritance: Single – Hierarchical – Multi Level – Multiple.

UNIT – 4 **(15-hours)**

Interfaces, Packages and Exceptions - Multiple Inheritance: Defining Interfaces – Implementing Interfaces – Packages: Creating Packages – Accessing Packages – Exception Handling: Types of errors – Try and Catch – Multiple Catch – Finally.

UNIT – 5 **(15-hours)**

The Applet Class - Basics – Building applet code – Applet Life Cycle – Creating an Executable Applet – Designing a Web Page – Running the Applet –Graphics programming: The Graphic Class – Lines and Rectangles – Circles and Ellipses.

Text Book

1. Programming with Java, 4th Edition, E. Balagurusamy, Tata McGraw Hill Pub. Ltd., New Delhi.

Reference Book

1. Java 2: The Complete Reference, 5th Edition, Herbert Schildt, Tata McGraw Hill Pub. Ltd., New Delhi.

LAB: JAVA PROGRAMMING

Hours: 5hrs/week 75 Hrs **Sub. Cod: U2CCC5P**
Credits: 3
Course Outcomes:

Students, after successful completion of the course, will be able to

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
2. Demonstrate understanding and use of different exception handling mechanisms for robust faster and efficient application development.
3. Identify and describe common abstract user interface components to design GUI in Java using Applet

List of Programs

1) Write a Java program to find out the biggest number among the given three numbers using if...else statement.
2) Write a Java program to check whether the number is Palindrome or not.
3) Write a Java program to generate Fibonacci series.
4) Write a Java program to create Multiplication Table.

5) Write a Program to create an account with a Bank and Deposit 20,000. The minimum Balance in the account shall be 500. Use switch case statement for Deposit, Withdrawal and Balance enquiry.
6) Write a Java program for sorting an array.
7) Write a Java program to find the position of a given element in an array.
8) Write a Java program to perform multiplication of two given numbers using Nesting of Methods.
9) Write a Java program to perform string handling methods using packages.
10) Write a Java program to demonstrate built-in exceptions.
11) Write a Java program to create a window with three color options, red, green and blue. The applet should change the colors according to the selection.
12) Write a Java program to perform Arithmetic operations using Applet.

BUSINESS LAW

Hours: 5hrs/week 75 Hrs **Subject Code: U3CCC53**
Credits: 4

Course Outcomes:
Students, after successful completion of the course, will be able to

1. Identify the fundamental legal principles behind contractual agreements.
2. Gain knowledge on various provisions of the business law.
3. Acquire capacity to understand the implication of business law in practice.

UNIT – 1 **(15 hours)**

Law of contracts: Definition – Nature of contract – Classification of contract - Essential elements of a valid contract – Offer – Types of offer – Essentials of a valid offer - Acceptance – Legal rules of a valid acceptance – Consideration – Essential parts of the consideration – Legal rules for a valid consideration - Capacity of parties.

UNIT – 2 **(15 hours)**

Performance of Contracts: Various modes of discharge of contracts- Breach of contracts- Types - Remedies for breach of contracts - Quasi contracts – Features – Types.

UNIT – 3 **(15 hours)**

Bailment: Definition – Essentials – Rights and duties of bailor and bailee -Bailee's lien– Finder of lost goods – Rights and duties of finder of goods - Discharge of bailment contracts.

UNIT – 4 **(15 hours)**

Sale of goods Act 1930 - Sale and Agreement to sell – Classification of goods – Rights and Duties of buyer – Rights and Duties of Seller – Rights of Unpaid seller – Sale by non-owners - Rules regarding delivery of goods.

UNIT – 5 **(15 hours)**

The Consumer Protection Act, 1986: Definition – Aims - Consumer Protection Council – Consumer disputes – Redressal – Agencies at various levels - District Forum, State

Commission - National Commission – Penalties – Reasons for slow growth of consumer movement in India.

The Competition Act, 2002 - definition – Factors which cause adverse effect on competition – competition commission of India – duties, powers and functions of the commission.

Text Book:

1. Elements of Mercantile Law – N.D. Kapoor

Reference Books

1. Business law – R.S.N. Pillai & Bagawathi
2. Business law – S.N. Maheshwari & S.K. Maheshwari.
3. Business Law - D. Chandra Bose.

INCOME TAX

Hours: 6hrs/week 90 Hrs **Subject Code: U3CCE51**
Credits: 5

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand provisions of Income Tax Act.
2. Gain knowledge on residential status and incidence of tax.
3. Acquire capacity to compute income from various heads and tax liability.

UNIT – 1 **(18-hours)**

Income Tax Act, 1961 – Definition – Income – Assessment – Assessment Year – Previous Year – Person – Assessee –Types of assessee – Residential status – Deemed income – Exempted Incomes U/s 10

UNIT – 2 **(18-hours)**

Income from Salary - meaning – Allowances - Taxable, Special and Exempted, Perquisites - Accommodation, Motor car and Leave Travel Allowance – Profit in lieu of salary.

Income from House property – GAV, NAV, Interest on loan- Computation of income from Self Occupied and let out properties.

UNIT – 3 **(18-hours)**

Profits and Gains from Business or Profession – Depreciation, allowable and disallowable deductions

UNIT – 4 **(18-hours)**

Capital gains – Short Term and Long Term - Income from Other Sources

UNIT – 5 **(18-hours)**

Clubbing of Income – Set-off and Carry forward of Losses – Deductions from Gross Total Income- Sec 80C, 80D, 80DD, 80E, 80G, 80TTA, 80U.

Note: Distribution of marks - Theory - 40% and Problems - 60%

Text Book
1. Income Tax Law and Practice – T.S. Reddy and A. Murthy

Reference Books
1. Income Tax Law and Practice – Bhagavathi Prasad
2. Students Guide to Income Tax – Vinod K. Singhania
3. Income Tax Law and Practice – H.C. Mahrotra
4. Income Tax Law and Practice – V.P. Gaur and D.B. Narang

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**
Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **(6-hours)**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**
Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**
Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**
General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:
1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME: BUSINESS ACCOUNTING

Hours: 2hrs/week 30 Hrs **Subject Code: U2CCN51**
Credits: 2
Course Outcomes:
Students, after successful completion of the course, will be able to
1. Understand basic principles of book-keeping.
2. Gain knowledge on the preparation of journal.
3. Acquire capacity to prepare subsidiary books and final accounts.

UNIT – 1 **(6 hours)**

Introduction – Book keeping – Accountancy – Double entry system – Classification of accounts – Rules – Scope, Advantages and limitations of Double entry system

UNIT – 2 **(6 hours)**

Books of original entry – Journal – Ruling of journal book – Advantages of Journal

UNIT – 3 **(6 hours)**

Subsidiary books – Purpose – single and double column cash book– Purchase, sales and their returns books

UNIT – 4 **(6 hours)**

Ledgers – posting – purpose – ruling and balancing of the ledger account – preparation of Trial Balance from the given balances

UNIT – 5 **(6 hours)**

Final accounts of sole trading concerns with simple adjustments namely closing stock, outstanding expense, accrued income, depreciation.

Note: Distribution of marks - Theory - 40% and Problems - 60%

Text Books

1. Advanced Accountancy – T.S. Reddy and A. Murthy
2. Financial accounting – R.S.N. Pillai & Bagawathi

Reference Books

1. Advanced accounts – M.C. Shukla and T.S. Grewal
2. Principles and practice of accounting – R.L. Gupta and V.K. Gupta

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B.Com. VI Semester
MANAGEMENT ACCOUNTING

Hours: 6hrs/week 90 Hrs **Subject code: U3CCC61**
Credits: 5

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand the basic concepts of management accounting.
2. Get clear knowledge about the preparation of various types of budgets.
3. Gain knowledge on concepts of marginal costing.

UNIT – 1 **(18 hours)**

Management accounting – meaning – definitions – characteristics – scope – objectives and functions – distinction between financial accounting and management accounting – distinction between management accounting and cost accounting – tools and techniques of management accounting – advantages and limitations.

UNIT – 2 **(18 hours)**

Ratio analysis – meaning – advantages – limitations – classification of ratios – computation of profitability ratios – turnover ratios – solvency ratios.

UNIT – 3 **(18 hours)**

Cash flow statement – meaning, importance and limitations - Calculation of cash from operations – Preparation of cash flow statement (indirect method only) as per Ind AS 7 – operating activities, financing activities and investment activities (simple problems only).

UNIT – 4 **(18 hours)**

Marginal costing – meaning, assumptions, advantages and limitations - Break even analysis – PV ratio – Margin of safety (Excluding the application of marginal costing for managerial decisions)

UNIT – 5 **(18 hours)**

Budgeting and budgetary control – meaning – objectives – advantages – limitations – essentials of successful budgetary control – classification of budget – preparation of sales budget, production budget, purchase budget, cash budget and flexible budget.

Note: Distribution of marks - Theory - 20% and Problems - 80%

Text Books

1. Management Accounting – R.S.N. Pillai & Bhavathi
2. Management Accounting – T.S. Reddy & Y. Hari Prasad Reddy

Reference Books

1. Management Accounting – M.Y. Khan and P.K. Jain
2. Management Accounting – S.N. Maheswari

INTERNET AND WEB TECHNOLOGIES

Hours: 6hrs/week 90 Hrs **Sub. Code: U2CCC62**

Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Analyze a web page and identify its elements and attributes.
2. Gain knowledge on developing a dynamic web page by the use of Java script and HTML.
3. Demonstrate Rich Internet Applications.

UNIT – 1 **(18-hours)**

Introduction to Internet– Networking – Internet – Electronic Mail– Gopher– World Wide Web –Usenet –Telnet- Bulletin Boards —Internet Addressing – Physical Connections - Modem –Telephone Lines–Internet Browsers: Internet Explorer, Firebox, Chrome.

UNIT – 2 **(18-hours)**

HTML: Designing a home page – HTML Generations –HTML Documents – Anchor Tag – Hyper Links– Head and Body Section: Header Section –Title –Links – Colorful Web

page – Comment Lines – Heading –Aligning the Headings – Horizontal Rule - Paragraph – Tab Settings – Images and Pictures – Embedding PNG Format Images.

UNIT – 3 **(18-hours)**

Ordered and Unordered Lists - Nested Lists – Table Creation – Width of the Table and Cells - Cells Spanning Rows/Columns – Coloring Cells – Column Specification – Frames: Frameset definition – Nested Framesets.

UNIT – 4 **(18-hours)**

Forms: Action Attribute – Method Attribute – Enctype Attribute – forms controls – DHTML and Style Sheets - Defining Styles – Elements of Styles – Linking a Style Sheet to HTML Document - In-Line Styles – External Style Sheets – Internal Style Sheets– Multiple Styles.

UNIT - 5 **(18-hours)**

Java Script: Writing Java Script into HTML – Data Types and Literals –Type Casting – Creating Variables – Operators and Expressions – Programming Constructs – Conditional Checking – Looping – Functions.

Text Books

1. WWW with HTML – C. Xavier Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2010.
2. Web Enabled Commercial Application Development using ….HTML, DHTML, Java Script, Perl CGI –Ivan Bayross BPB Publisher 4th Edition 2005.

Reference Books

1. Web Technology – N.P. Gopalan & J. Akilandeswari PHI Learning Pvt. Ltd. Delhi 2014.
2. Java Script Step by Step – Steve Suehring. Microsoft 3rd Edition

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SPECIAL ACCOUNTS

Hours: 6hrs/week 90 Hrs **Subject Code: U3CCC63**
Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Understand the accounting procedure for Holding Company Account.
2. Gain knowledge on the preparation of accounts for Banking and Insurance Company.
3. Acquire capacity to prepare the accounts for various public utility concerns.

UNIT – 1 **(18 Hours)**

Holding Company Accounts - Preparation of Consolidated Balance Sheets with treatment of intercompany Owings, Unrealized Profit, Bonus issue (Inter Company Holdings excluded).

UNIT – 2 **(18 Hours)**

Banking Company Accounts – Rebate on Bills Discounted - Preparation of Profit and Loss Account and Balance Sheet (New format only)

UNIT – 3 **(18 Hours)**

Insurance Company accounts: Life Insurance and General Insurance- Final accounts and schedules (New format only)

UNIT – 4 **(18 Hours)**

Final of Accounts of public utility concerns - Electricity Companies, Railways – Replacement of an asset (Excluding Disposal of surplus).

UNIT – 5 **(18 Hours)**

Indian Accounting Standards: Meaning – Scope – Objectives - Advantages – Disadvantages - Framework for Preparation and Presentation of Financial Statements in accordance with Indian Accounting Standards (Theory only).

Note: Distribution of marks - Theory - 20% and Problems - 80%

Text Books

1. Corporate accounting – T.S. Reddy and A. Murthy

Reference Books

1. Advanced accounts – S.P. Jain & K.L. Narang
2. Advanced accountancy – S.N. Maheswari & S.K. Maheswari
3. Advanced accountancy – P.C. Tulsian

LAB: WEB DESIGN

Hours: 6hrs/week 90 Hrs **Sub. Code: U2CCC6P**
Credit : 4

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Design a basic web site using HTML5 to demonstrate responsive web design.
2. Design, develop and host a user friendly website.
3. Implement dynamic web pages with validation using JavaScript objects by applying different event handling mechanism.

List of Programs

1. Create a web page to show the different attributes of font tags.
2. Create a web Page using HREF tag having the attribute LINK, ALINK and VLINK
3. Create a web page with appropriate contents inserting an image as anchor at the left hand side of the page to open another web page.
4. Create a HTML document containing a nested list showing the contents of a book.
5. Create the following table in HTML with Dummy Data

Name of the train	Place	Destination	Train No.	Time		Fare
				Arrival	Departure	

6. Create a web page for bike show room using frameset.
7. Create a simple form with submit button accepting name and register number.
8. Write a CSS script to change the background color of a web page.
9. Write a Java script program to find out the Square Root of a given number.
10. Write a Java Script program to prepare student mark list.
11. Write a Java Script program to perform arithmetic operations using functions.
12. Write a Java script program to find largest and the smallest integers in the group

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PROJECT WORK

Hours: 2 hrs/week 30 Hrs **Subject Code: U1CC6PR**
Credits:2

Course outcomes:
Students, after successful completion of the course, will be able to

1. Gain knowledge on analysing the business problems.
2. Understand the methodology of report writing.
3. Write project reports.

PROJECT TOPIC:
Any Commerce and industry related topics.

GUIDELINES:

1. Combined project of 5 students each.
2. Project report should be typed in A4 size paper with a minimum of 30 pages.
3. Format: Font – Times New Roman, Size – 12, Single side typing, Double line spacing.
4. Binding – Spiral binding.

Evaluation: Internal evaluation only - Project – 50 marks; Viva-voce – 50 marks

THE COMPONENTS OF A PROJECT REPORT
The outcome of Project Work is the Project Report. A project report should have the following components:
1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2) Student's Declaration
3) Supervisor's Certificate
4) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.
5) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
6*) Body of the Report:* The body of the report should have these four logical divisions
5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.
6) Annexures: Questionnaires/Interview schedule (if any), relevant reports, etc.

LAB: BUSINESS ACCOUNTING SOFTWARE

Hours: 2hrs/week 30 Hrs **Subject Code: U3CCS6P**
Credits: 2

Course Outcomes:
Students, after successful completion of the course, will be able to
1. Understand the basic concepts of Tally.
2. Get clear knowledge about the preparation of various types of Vouchers.
3. Acquire capacity to prepare the sales invoices with GST Calculation.

List of Programs

1. Create a new company with ledger creation including opening balance.
2. Prepare journal entries and display the Day book, Trial Balance and Final accounts.
3. Prepare final accounts with the adjustments for :
    a. Closing stock
    b. Outstanding Expenses
    c. Prepaid expenses
    d. Depreciation
    e. Income received in advance
    f. Interest on capital
    g. Interest on drawings
4. Create a cost centre and cost category.
5. Creation of stock group, stock item and units of measure.
6. Create Inventory vouchers.
7. New Voucher Creation.
8. Make sales and purchase invoice with GST Calculation.
9. Submission of GST returns.
10. Demonstrate Restore and Data Backup.

NME: PRINCIPLES OF MARKETING

Hours: 2 hrs/ week 30 hrs **Subject code: U3CCN61**
Credits: 4

Course Outcomes:
Students, after successful completion of the course, will be able to
1. Gain knowledge on basic principles of marketing.
2. Understand the components of marketing mix.
3. Obtain information on the pricing policies and promotional tools.

UNIT-1 **(6 Hours)**

Marketing – Definition, meaning – types – Importance - Functions.

UNIT –2 **(6 Hours)**

Product – Types - New Product Development - Product Life Cycle.

UNIT –3 **(6 Hours)**

Pricing-Objectives — Determinants of Price - Methods of Pricing

UNIT- 4 **(6 Hours)**

Physical Distribution - Types of Channels - Selection of Channel.

UNIT – 5 **(6 Hours)**

Promotion - Advertising – Advertising media - Personal selling, Sales promotion - Types, Distinction between advertising and Personal selling.

Text Books:-

1. Principles of Marketing – R.S.N. Pillai
2. Principles of Marketing – Rajan Nair

Reference Books

1. Marketing – Philip Kotler
2. Marketing Management – C.B. Memoria

COURSE NAME : BACHELOR OF BUSINESS ADMINISTRATION
DISCIPLINE : BUSINESS ADMINISTRATION
(For those who Join in 2018 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	CORE 12	Operations Management	5	4	25+75=100	U2BAC51	Skill Development	No Change
	CORE 13	Retail Management	5	4	25+75=100	U2BAC52	Entrepreneurship	No Change
	CORE 14	Management Accounting	5	4	25+75=100	U3BAC53	Skill Development	Revised 10%
	CORE 15	Research Methodology	5	4	25+75=100	U2BAC54	Skill Development	Revised 20%
	ELECTIVE 2	Sales Management	6	5	25+75=100	U3BAE51	Employability	Revised 50%
	SBE- 4	Employability Skills	2	2	25+75=100	U1PS51	Employability	No Change
	NME 1	Principles Of Management	2	2	25+75=100	U2BAN51	Skill Development	No Change

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
VI	CORE 16	Financial Management	6	4	25+75 = 100	U2BAC61	Skill Development	Revised 20%
	CORE 17	Services Marketing	6	4	25+75 = 100	U2BAC62	Skill Development	Revised 20%
	CORE 18	Human Resource Management	6	4	25+75 = 100	U2BAC63	Skill Development	No Change
	ELECTIVE 3	Project Report	6	5	100+0 = 100	U2BA6PR	Skill Development	No Change
	SBE 5	Soft Skills	2	2	25+75 = 100	U2BAS61	Skill Development	No Change
	SBE 6	Personality Development	2	2	25+75 = 100	U3BAS62	Skill Development	Revised 40%
	NME 2	Entrepreneurship	2	2	25+75=100	U2BAN61	Entrepreneurship Skill	Revised 20%

Self Learning Courses:

Subject	Semester	Credit	Ext =Tot	Subject Code
Company Organisation	V	5	100 = 100	U1BASL51

OPERATIONS MANAGEMENT

Contact Hours per week: 5 Subject Code: U2BAC51
Contact Hours per Semester: 75 Credits: 4

Course Outcome:

CO 1 : Enlighten on various functions of production management and manufacturing Practices.
CO 2 : List out the factors affecting plant location and the principles of plant layout.
CO 3 : Describe material management with its objections, functions and its importance.
CO 4 : Understand Double bin system, ABC analysis, production planning and control.
CO 5 : Impart knowledge about Quality control, Quality circles and TQM.

Objective: To enlighten the students on various functions of production management and manufacturing practices.

UNIT-1 **[15 Hours]**

Operations management – Meaning – scope - production systems - continuous production – Intermittent production – mass & flow production - Batch production – job order production.

UNIT-2 **[15 Hours]**

Plant location – Importance – Factors affecting plant location. Plant layout – Principles – Process layout – product layout – Fixed position layout.

UNIT-3 **[15 Hours]**

Material management – Objectives - Functions of inventories – Inventory control and its importance – Double bin system - ABC analysis, Production planning and control – meaning and importance.

UNIT-4 **[15 Hours]**

Plant maintenance – Importance - breakdown maintenance – Preventive maintenance and predictive maintenance - work study: Meaning and Importance. Material handling – Principles of material handling.

UNIT-5 **[15 Hours]**

Quality control – Need and importance – Control charts and their uses. Quality Circles and its benefits - TQM and its benefits - ISO 9000 series – Objectives – benefits – Steps in ISO 9000 Registration.

TEXT BOOK

1. Production and Operations Management – Dr.S.Anil Kumar, N.Suresh, New Age International Publishers, 2009.

REFERENCE BOOKS

1. Production and Operation Management- Dr.B.S.Goel, Pragati prakashan publications.
2. Production and Materials Management – P.Saravanavel, S.Sumathi, Margham Publications - 2016
3. Production Management – Elwood S.Buffa (Johnuron)

RETAIL MANAGEMENT

Contact Hours per week: 5 Subject Code: U2BAC52
Contact Hours per Semester: 75 Credits: 4

Objectives: To provide a basic theoretical framework of the concepts of Retail Management and to enable the students to identify the retailing opportunities.

Course Outcomes:

CO 1 : Provide a basic theoretical framework of the concepts of retail management.

CO 2 : Analyse Retailers with their functions, characteristics and various types.
CO 3 : Understand retail promotional objectives and promotional advertising.
CO 4 : Describe retail pricing policies and strategies, FDI in retailing and service retailing.
CO 5 : Introduce Online retail with its types, and also complaints management.

UNIT I: Introduction to Retailing - Definition – Features- importance- Organized Retailing in India - Major Players in retailing - Retailing In India – Evolution - Drivers of Retail Change- Challenges to Retail Development In India. **[15 Hours]**

UNIT II: Retailer – Functions – Characteristics – Classification - Store Retailer - Non Store Retailer - Retail Organization - Types – Itinerant retailers-Fixed Shop Retailers - Small scale retailers - Large Scale Retailers - Meaning and features. **[15 Hours]**

UNIT – III: Retail Communication and Promotion-Definition of Retail Promotion-Promotional Objectives - SMARRTT- Promotional advertising - Window Display – Interior Display - Show Rooms – Exhibitions. Sales promotion – Kinds - Consumer Sales Promotion
- Dealers Sales Promotion - Sales Force Promotion. **[15 Hours]**

UNIT – IV: Retail pricing –Definition - Factors influencing Pricing - Pricing Policies-Cost Oriented Pricing - Competition Oriented pricing - Retailing Pricing Strategies - MarketSkimming - Market Penetration - Price Bundling - Leader Pricing – Every Day Low Pricing - ODD Pricing - FDI in retailing – Services retailing. **[15 Hours]**

UNIT – V: Complaints Management – Characteristics – Objectives - Steps for effective complaint Management - advantages. Online Retail – Types - Key enablers of Online Retailing - Strategies of Online Retailer – Barriers to growth in e-tailings- advantages and disadvantages. **[15 Hours]**

TEXT BOOK:

1. Retail Management, Dr.L.Natarajan, First Edition, Margham publications, Chennai.

Reference Books:

1. Retail Management, Suja Nair, 4th Edition, Himalaya publishing House.
2. Retail Management, Swapna Pradhan, Tata McGraw Hill publishing company Ltd.

MANAGEMENT ACCOUNTING

Contact Hours per week: 5 Subject Code: U3BAC53
Contact Hours per Semester: 75 Credits: 4

Course outcome :

Students, after successful completion of the course, will be able to
CO 1: Know about various functions of management accounting and financial statement analysis
CO 2: Understand reporting and preparing ratio analysis with its merits and demerits
CO 3: Analyze fund flow statement with its merits, demerits and also cash flow statement with its uses
CO 4: Understand the meaning of Marginal costing, break-even analysis, profit column ratio and margin of safety.
CO 5: Understand the objections of budgetary control with its merits, demerits and various classifications.

UNIT I **[15 Hours]**

Management Accounting – Meaning, nature, Functions, advantages and disadvantages of Management Accounting, Differences between Management Accounting and Financial accounting - Financial statement Analysis – comparative, common size and Trend Percentages

UNIT II **[15 Hours]**

Ratio Analysis – Meaning, Merits and demerits – classification of Ratios – Profitability Ratios, Turnover Ratios and financial Ratios. (Simple Problems only)

UNIT III **[15 Hours]**

Fund Flow Statement – Meaning, merits and demerits – preparation of fund flow statement. (Simple problems only) – Cash Flow Statement – Meaning – Uses - Differences between Fund flow statement and Cash flow statement (Only theory).

UNIT IV **[15 Hours]**

Marginal costing – Meaning, merits and demerits - Break – Even Analysis – Assumptions - profit volume Ratio, Margin of safety, maintaining a desired level of profit (Simple problems only). Standard Costing (simple problems) –Meaning, merits and demerits – Material, Labour & Overheads only – Variance analysis (Simple problems only)

[15 Hours]

UNIT V

Budgetary Control – Meaning, objectives, merits and demerits – Classification of Budgets - (Problems only from cash Budget and Flexible Budget). **[15 Hours]**

Note: 60% marks for problems and 40% marks for theory.

TEXTBOOKS

1. Management Accounting- R.S.N.Pillai and Bagavathi, S.Chand publisher.

REFERENCE BOOK

1. Financial & Management Accounting- S.N. Maheswari, Sultan Chand & Sons publisher.
2. Management Accounting by Khan and Jain, Tata McGraw Hill, 3rd Edition.

RESEARCH METHODOLOGY

Contact Hours per week: 5 Subject Code: U2BAC54
Contact Hours per Semester: 75 Credits: 4

Course Outcomes

Students, after successful completion of the course will be able to

CO 1 : Provide basic theoretical framework of the concepts of research methodology.
CO 2 : Impart knowledge about sampling objectives, characteristics and sampling methods.
CO 3 : Understand the various methods of data collection and the requisites of a good questionnaire.
CO 4 : Analyze data processing: Editing, coding, tabulation and interpretation of data.
CO 5 : Understand the essentials of report writing and steps in report writing with its contents.

Unit – I: **[15 Hours]**

Research Methodology: Introduction – Meaning – Objectives – Types – Significance –

Research Process – Problems encountered by Researchers in India – Criteria of Good Research - Research Design – Meaning – Need and importance.

Unit – II: **[15 Hours]**

Sampling: Definition - Characteristics – Probability and Non-Probability Sampling methods. Scaling: Definition – Scale Classification bases – Scaling Techniques**.**

Unit – III: **[15 Hours]**

Data Collection: Types of data – Data Sources – Methods of Collection of Primary Data. Questionnaire: Meaning – Collection of data through questionnaire – Questionnaire vs Schedule.

Unit – IV: **[15 Hours]**

Data Processing: Editing, Coding, Classification and Tabulation - Analysis of Data – Meaning – Importance – Role of statistics in research. Interpretation of data: Meaning – Different forms – Need for Interpretation. Hypothesis: Meaning - Null and Alternate hypothesis only.

Unit – V: **[15 Hours]**

Report writing: Report – Meaning – Essentials of a good report – Types of report – Steps in Report writing – Layout of Research report. Use of library and internet in research.

TEXT BOOK

1. Research Methodology, Methods & Techniques – C.R.Kothari – New Age International Publishers second revision.

REFERENCE BOOK

1. Research Methods in Social Sciences – Dr.S.Nakkiran Dr.R.Selvaraju – Himalaya Publishing House.
2. Research Methodology by R.Panneer Selvam, PHI Learning Private Limited.

SALES MANAGEMENT

Contact Hours per week: 6 Subject Code: U3BAE51
Contact Hours per Semester: 90 Credits: 5

Course outcome:

CO 1: Familiarised with sales management practices and selling techniques.
CO 2: Understand the existing practices in sales management and personal selling
CO 3: Analyse the sales planning process, the factors influencing sales forecase and the mentods of sales budgeting
CO 4 Understand the management of sales force, recruitment, selection and training of sales force.
CO 5: Understand the meaning of sales report, sales quota, sales territories, sales force compensation and motivation
CO 6: Gain Knowledge about the process of effective selling, prospecting, approach, presentation, demonstration, handling objections, closing the sale and follow-up.

UNIT-I **[18 Hours]**

Sales Management: Meaning and definition – objectives and scope – functions of sales management – Personal selling: meaning and definition – nature of personal selling-objectives and importance of personal selling – Salesman: types of salesman – characteristics of a successful salesman.

UNIT-II **[18 Hours]**

Sales planning - Sales planning process – Sales forecasting – objectives- factors influencing sales forecast – steps in sales forecasting – methods of sales forecasting – Sales budget: meaning – purposes and advantages – procedure of sales budgeting – methods of sales budgeting.

UNIT-III **[18Hours]**

Process of effective selling: prospecting – types of prospects – steps in prospecting – Pre-approach: need and importance – Approach: methods of approach – Presentation: meaning and essentials of presentation – Demonstration: meaning and essentials of demonstration – Handling objections: Reasons – types of objections – methods of handling objections – Closing the sale: Techniques – requisites of successful closing – Follow- up

UNIT-IV **[18 Hours]**

Management of sales force: Sales force planning – determining the size and quality of sales force – Recruitment and selection of sales force: meaning and nature of recruitment and selection – importance – guidelines for effective recruitment – training and development of sales force - Sales force compensation: Compensation plan – essentials of a good compensation plan – methods of compensation: Sales force motivation: Techniques of sales force motivation.

UNIT-V **[18 Hours]**

Control and supervision of sales force: Bases of control – Sales report: Purposes – types – contents – qualities of a good sales report - Sales quota: types of quota – quota setting procedure – advantages of sales quota – Sales territories: meaning – factors deciding territories – establishing sales territories –benefits.

Text Book:

1. Advertising and Personal Selling – Dr.C.B.Gupta, Sultan Chand & Sons.

Reference Books:

1. Sales Management – Richard R.Still, Edward W.Cundiff, Norman A.P.govari – Prentice Hall of India.
2. Advertising and Salesmanship – P.Saravanavel and S.Sumathi, Margham Publications, 2015.

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**

Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **(6-hours)**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**

Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**

Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**

General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME 1 – PRINCIPLES OF MANAGEMENT

Contact Hours per week: 2 Subject Code: U2BAN51
Contact Hours per Semester: 30 Credits: 2

Objectives

To enable the student to secure basic knowledge in Business Administration and management practices.

UNIT – I **[6 Hours]**

Management – Definition – Nature of Management, Levels of Management and Functions of Management - Henry Fayol's 14 Principles of Management - Contributions of F.W.Taylor.

UNIT– II **[6 Hours]**

Planning – Definition, Nature of planning, advantages and Limitations of planning and Steps in planning.

UNIT– III **[6 Hours]**

Organization – Meaning and Importance - Types of organization: Line organization, line and staff organization and functional organization (3 Types only).

UNIT– IV **[6 Hours]**

Motivation – Meaning, Nature of Motivation and Maslow's theory of motivation. Leadership – meaning, Qualities of a good leader and kinds of Leadership styles; Autocratic, Democratic and free rein leader. (3 Types only).

UNIT V **[6 Hours]**

Communication – Meaning, process of communication, Barriers in Communication and Measures to overcome communication barriers - Controlling – meaning, Nature of control and Steps in controlling.

Text Books

1. Principles of Management – J.Jaisankar, Margham Publications.

Reference Books:

1. Business Administration – R.K.Sharma and Shashi K.Gupta, Kalyani Publisher.
2. Management theory & Practice – C.B.Gupta, Sultan Chand Publisher

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VI- SEMESTER

FINANCIAL MANAGEMENT

Contact Hours per week: 6 | Subject Code: U2BAC61
Contact Hours per Semester: 90 | Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

CO 1 : Acquire the knowledge of various functions of financial management, financial decisions, investment decisions and dividend decisions.
CO 2 : Write down the source of capital, types of securities and capital structure.
CO 3 : Understand the determinants and estimations of working capital and also Cash management.
CO 4 : Analyze the cost of capital, cost of Debt and cost of equity.
CO 5 : Describe the capital budgeting, forms of dividend and factors affecting dividend policy.

UNIT-1 :

Financial Management – Definition – Objectives of the firm : Profit maximization Vs wealth maximization – Functions of finance – Financial Decisions – Investment decision– Financing Decision and Dividend decision – Organization of the finance function – Controller Vs Treasurer. **[18 Hours]**

UNIT-2 :

Sources of Capital – Long term, intermediate term and short term – types of securities – Debt, Equity and Preferred Stock. Capital structure – Forms – Importance – Factors determining capital structure - Theories of capital structure (only Theory) – Problems on EBIT – EPS analysis. **[18 Hours]**

UNIT-3 :

Working capital Management – Concept of working capital – Kinds of working capital - Determinants of working capital – Estimation of Working Capital (Problem) - Cash Management - Motives for holding cash – Receivables management – Objectives – Credit Policy – Credit Period (Only theory) **[18 Hours]**

UNIT-4:

Cost of capital – Meaning and Definition – Significance – Classification of cost- Determination of Cost of Capital – Cost of Debt – Cost of Equity - Cost of Preference Shares- Weighted average cost of capital (Theory & Problems). **[18 Hours]**

UNIT-5:

Capital budgeting – Techniques – Investment evaluation methods: Payback Period, Accounting rate of return – Net present Value and Internal rate of return (problem on IRR to be excluded). Dividend policy – factors affecting dividend policy – Forms of dividends - Stock dividend and stock split (Theory only). **[18 Hours]**

***NOTE*:** Question must be asked 40% on theory 60% on problems.

TEXT BOOK:

1. Financial management, Shashi K. Gupta & R.K. Sharma Kalyani Publishers, New Delhi.

Reference Books:

1. Financial Management – Principles & Practice – Dr.S.N.Maheswari, Sultan Chand & Sons, New Delhi.
2. Financial Management – Text and Problems – M.Y.Khan & P.K.Jain.

SERVICES MARKETING

Contact Hours per week: 6 | Subject Code: U2BAC62
Contact Hours per Semester: 90 | Credits: 4

Course Outcomes:

Students, after successful completion of the course, will be able to

CO 1 : Understand service marketing, nature and classification of service.
CO 2 : Analyze service product concept, branding and service positioning and pricing in services.
CO 3 : Determine promotion mix for services and channels in service delivery.
CO 4 : Identify the people in services and the role of customer in service delivery.
CO 5 : Impart knowledge about Physical evidence, Tourism marketing, Bank marketing, Hospital marketing and Hotel marketing.

UNIT-1: **[18 Hours]**

Services marketing – Introduction and definition – Types of services – Nature and characteristics of services - Difference between services and goods - Marketing Management Process for services – Services Marketing Mix: Meaning and Elements.

UNIT-2: **[18 Hours]**

Service product: Meaning – Service concept - Service life cycle concept – New Service Development - Branding and Service Positioning. Pricing in Services: Meaning - Objectives of pricing – Factors affecting pricing decisions – Methods of pricing – Pricing Strategies.

UNIT-3: **[18 Hours]**

Service promotion: Meaning - Promotion mix for services – Advertising –Sales Promotion – Personal Selling – Word of mouth Communication – Public relation and Publicity. Place in service: Meaning – Channels in Service Delivery – Designing a distribution system – Functions of service intermediaries.

UNIT-4: **[18 Hours]**

People in Services: Introduction – Types of Service Personnel – Customer contact employees and Support Personnel – Role of customer in service delivery. Service Process: Meaning - Designing service process – Service Blue Print – Meaning and Importance.

UNIT-5: **[18 Hours]**

Physical Evidence: Meaning – Physical facilities – Physical environment – Social Setting. Marketing of Services: Tourism marketing - Bank marketing – Hospital marketing – Airline marketing.

TEXT BOOK

1. Services Marketing – Vasanti Venugopal, Raghu,V.N. Himalaya Publishing House.

Reference Books:

1. Services Marketing – S.M. Jha . Himalaya Publishing House.
2. Services Marketing - Appaniah, Reddy, Himalaya Publishing House.

HUMAN RESOURCE MANAGEMENT

Contact Hours per week: 6 | Subject Code: U2BAC63
Contact Hours per Semester: 90 | Credits: 4

Course Outcome:

CO 1 : Enable to secure basic knowledge in Human resource management and Human resource planning.

CO 2 : Describe Job analysis, Job description. Job specification, Recruitment and selection.

CO 3 : Understand the importance of training and wage and salary administration.

CO 4 : Analyse the performance appraisal and worker's participation in management.

CO 5 : Enlighten the importance of Industrial relations and importance of collective bargaining.

Objectives: To enable the student to secure basic knowledge in Human resource management practices.

Unit I:

Human Resource Management – Definition, Nature, objectives and functions of HRM - Role of Human Resource Manager. Human Resource Planning – Objectives, importance and Human Resource Planning process. **[18 Hours]**

Unit II:

Job Analysis – Meaning and Process of Job Analysis - Job Description – Job specification. Recruitment – Meaning, factors affecting recruitment and sources of recruitment. Selection – Meaning and selection process - Placement and Induction. **[18 Hours]**

Unit III:

Training – Importance – Methods of Training and steps in training programme. Wage and Salary Administration – Objectives, components and methods of wage payment. **[18 Hours]**

Unit IV:

Performance Appraisal – Meaning, objectives of Performance Appraisal - Methods of Performance Appraisal. Worker's Participation in Management - Meaning and Objectives of WPM. **[18 Hours]**

Unit V:

Industrial Relations – Objectives of IR, Importance of IR and parties to IR - Causes for poor IR - developing sound IR. Collective Bargaining - Meaning and Importance. **[18 Hours]**

Text Book:

1. Human Resource Management by S.S.Khanka, S.Chand Publisher

Reference Books:

1. Human Resource Management by Dr.J.Jayasankar, Margham Publications, 2016.
2. Human Resource Management by K.Aswathappa, McGraw Hill.
3. Human Resource Management by Dr.P.Subba Rao, Himalaya Publishing House.

PROJECT REPORT

Contact Hours per week: 6 Subject Code: U2BA6PR
Contact Hours per Semester: 90 Credits: 5

RULES GOVERNING PROJECT:

1. Each student should undergo a 3 week Field Study in any one Functional Area of Management like Marketing, Human Resources, Finance, etc.,
2. The student has to select the topic in consultation with the Faculty Guide and construct a questionnaire, if necessary and get approval before leaving for field work.
3. The project report comprising a minimum of 60 pages should be submitted to the college.
4. The project report must contain the following:
   a) Introduction b) Objectives c) Methodology d) Data analysis & Interpretation e) Findings f) Suggestions g) Conclusion h) Appendix
5. The student has to appear for a viva-voce examination that will be conducted before the end of Sixth Semester.
6. The submitted project report will be evaluated by the Internal Examiners as follows:

Project Report	- 60 marks
Viva Voce	- 40 marks
Total	- 100 marks

7. Passing Minimum is 40% of the aggregate.

SOFT SKILLS

Contact Hours per week: 2 Subject Code: U2BAS61
Contact Hours per Semester: 30 Credits: 2

Objectives: To enable the students to secure knowledge in soft skills.
Course Outcomes:
CO1: The students will be able to have enhanced soft skills.
CO2: Able to use the soft skills to give powerful presentation.
CO3: Able to perform well in the interviews.
CO4: Able to use their soft skills for promotions and growth in their professional career.

UNIT – I:
Soft skills: Meaning and definition – kinds of soft skills – steps to develop soft skills. Listening: meaning – importance – kinds of listening – advantages of active listening. **[6 Hours]**

UNIT – II:
Presentation Skills: Stages in successful presentation – Tips for powerful presentation. Public speaking: benefits – public speaking tips. Art of writing – meaning and writing tips. **[6 Hours]**

UNIT – III:
Group discussion: meaning – skills required for GD – Essential elements of GD – Tips to improve GD skills – traits tested in GD – Dos and Don'ts of GD – Gestures to be avoided in GD. **[6 Hours]**

UNIT – IV:
Resume preparation: meaning – qualities of a good resume – types of resumes – Resume writing tips – sequence of resume information – Dos and Don'ts in resume preparation. **[6 Hours]**

UNIT – V:
Interview skills: meaning – preparing for interview: Dress code, need for punctuality, avoiding tensions and nervousness – qualities observed during the interview – commonly asked questions in interview – tips to present well in interview. **[6 Hours]**

Text Book:
1. SOFT SKILLS - Dr. K. Alex, S.Chand Publications, New Delhi, 2012.
Reference Books:
1. Essentials of Business communication – Rajendra Pal.

PERSONALITY DEVELOPMENT

Contact Hours per week: 2 Subject Code: U3BAS62
Contact Hours per Semester: 30 Credits: 2

Course Outcomes:

Students, after successful completion of the course, will be able to
CO 1: Understand the common personality and psychological factors.
CO 2: Develop knowledge on personality theories.

CO 3: Develop implications on personality traits and perception.
CO 4: Understand the various forms of inter-personal behaviour.
CO 5: Analyze the self management techniques like yoga, asanas, etc.,

Unit-I: **[6 Hours]**

Personality – Meaning – Determinants of Personality – Theories of Personality (Psycho-Analytical theory and Chris Argyris's immaturity-maturity theory).

Unit-II: **[6 Hours]**

Personality Traits – Meaning – BIG FIVE traits – Characteristics – Locus of Control – Internal and External Locus of Control – Type 'A' and Type 'B' Personality.

Unit-III: **[6 Hours]**

Perception – Meaning – Nature – Importance – The Perception Process – Factors influencing the perception.

Unit-IV: **[6 Hours]**

Inter-Personal Behaviour – Transactional Analysis – Meaning – Analysis of EGO states (Parent Ego, Adult Ego and Child Ego) – Benefits of Transactional Analysis.

Unit-V: **[6 Hours]**

Self Management – Meditation – Meaning - Uses, Yogasanas – General principles – Uses – Concentration techniques – Self hypnotism – Self acceptance and growth.

Text Book:

1) Organisational Behaviour – Shashi K.Gupta and Rosy Joshi, Kalyani Publishers (First Edition).

Reference Books:

1) Organisational Behaviour – Fred Luthans, McGraw Hill Publication (9th Edition).
2) Organisational Behaviour – K.Aswathappa, Himalaya Publication (9th Edition).

NME-2
ENTREPRENEURSHIP

Contact Hours per week: 2 Subject Code: U2BAN61

Contact Hours per Semester: 30 Credits: 2

Cource Outcomes:

Students, after successful completion of the course, will be able to
CO 1: Explain the nature of entrepreneurial development functions.
CO 2: Understand the various types of entrepreneurs.
CO 3: Understand the concepts of small scale industries.
CO 4: Understand the project report preparation concepts.
CO 5: Understand incentives in small scale units.

UNIT – I: **[6 Hours]**

Entrepreneur – Meaning, characteristics of an entrepreneur, functions of an entrepreneur, Types of Entrepreneurs. Entrepreneurship – meaning – characteristics of entrepreneurship.

UNIT – II: **[6 Hours]**

Women entrepreneurs – Types of women Entrepreneur, problems of women

entrepreneurs and remedies. Rural entrepreneurship – meaning, problems of Rural Entrepreneurship.

UNIT – III: **[6 Hours]**

EDP – Meaning – Objectives – Phases. SSI – Meaning, Importance of SSI, problems faced by SSI.

UNIT – IV: **[6 Hours]**

Project Report – Meaning and Contents of the Report, Institutional support and finance to Entrepreneur – SISI, SIDCO, DIC and TIIC (4 Institutions only).

UNIT – V: **[6 Hours]**

Incentives for small scale units – Subsidy and Tax concessions. Sickness in SSI – Meaning, Causes of Industrial sickness and Measures to prevent sickness in SSI.

Text Books:

1. Entrepreneurial Development – Gordon and Natarajan, Himalaya Publishing House.
2. Entrepreneurial Development – S.S.Khanka, S.Chand Publishers.

Reference Book:

1. Entrepreneurial Development – Dr.C.B.Gupta & Dr.N.P.Srinivasan, Sultan & Chand Publishers.

GUIDELINES FOR VALUE ADDED COURSES

Classes shall be conducted after college working hours or on Saturdays which are declared holidays.

- Attendance Register of students has to be maintained by the respective department.
- There shall be only Internal Assessments and no External Examination.
- The maximum marks for each course is 100.
- The assessment shall be made on Continuous Internal Assessment basis. Accordingly there shall be five Internal Assessment Tests - One test after the completion of one unit.
- The maximum marks for each test shall be 20.
- The passing minimum for each course shall be 40.
- The Head of the Department has to arrange to send the consolidated marks for 100 to the Controller of Examinations' office after the completion of the course.
- Only students who have earned 75% of attendance and appeared for 3 tests shall be eligible to get the final certificate.
- Laminated Certificate will be issued to the students on successful completion of the course for which a sum Rs. 100 shall be collected from each student.

Question pattern for theory based value added courses

Duration: 1 hour Max: 20 marks

Section-A (3x2=6 marks)
Short Answer Questions:
3 questions to be asked (with or without choice)
Each question carries a maximum of 2 marks.

Section – B (2x7=14 marks)
2 questions to be asked (with or without choice)
Each question carries a maximum of 7 marks.

Question pattern for Practical Oriented Value Added Courses

a. 5 practical examinations to be conducted each for a maximum of 15 marks.
b. The final practical examination is mandatory for all the students to receive the final certificate to be conducted for 25 marks covering the whole syllabus.

Self-Learning Course
V - Semester
COMPANY ORGANISATION

Credit: 5 **Subject Code:** U1BASL51
Total marks 100

Unit – I

Company – Meaning- Definition- Features- Private company- Meaning- Privileges of Private company- Public company- Meaning- Differences between a Private Company and a Public company.

Unit – II

The Promoter- Functions of a Promoter- Important Documents of the Company- Memorandum of Association- Meaning- Contents- Articles of Association- Meaning- Contents- Prospectus- Meaning- Contents.

Unit – III

Directors- Meaning- Qualification and Disqualification of Directors- Appointment of Directors- Position of Directors- Removal of Directors- Powers, Duties, and Liabilities of Directors.

Unit – IV

Company Meetings- Meaning- Features- Types of Meetings- Essentials of a Valid Meeting: Notice- Agenda- Quorum- Motion- Minutes- Resolution(Meaning only)- Chairman- Powers and Duties of Chairman.

Unit – V

Winding up of Companies- Meaning- Methods of Winding up: Compulsory Winding up- Member's Voluntary Winding up- Creditor's voluntary Winding up- Winding up subject to the supervision of the court.

Text book:

1) Company Organisation – Dr. V.M. Selvaraj, Bavani Publications, 2012.

Reference Book:

1) Company Organisation – Kathiresan and Thirunavukkarasu.

COURSE NAME : BACHELOR OF BUSINESS ADMINISTRATION
DISCIPLINE : B.B.A
(For those who Join in 2018 and after)

Value Added Courses:

Subject	Semester	Credit	INT =Tot	Subject Code
Elements of Tally	VI		100 = 100	V1BA1
Investment Avenues	III		100 = 100	V1BA2
Secretarial Practice	V		100 = 100	V1BA3

VALUE ADDED COURSE

ELEMENTS OF TALLY

Contact Hours per week: 2 **Subject Code: V1BA1**
Contact Hours per Semester: 30

Course Outcome:

Students, after successful completion of the course, will be able to
CO1: know the principles of computerized accounting.
CO2: Apply the principles of computerized accounting in their job.
CO3: Keep firms' accounts in TALLY.
CO4: Offer services to the entrepreneurs in maintaining their accounts.

UNIT – I **[6 Hours]**

Tally – introduction - features of tally – opening screen of tally – Creating a company – Selecting a Company – Altering an existing company.

UNIT – II **[6 Hours]**

Creation of groups – Creation of Ledger accounts – Editing and deleting ledgers – Vouchers: voucher entry – creation of different types of vouchers – editing and deleting vouchers – invoices.

UNIT – III **[6 Hours]**

Inventories–creation of stock category, stock groups and stock items–stock vouchers – purchase and sales orders – pure inventory vouchers – units of measure – godowns.

UNIT – IV: **[6 Hours]**

Reports in Tally: working with day book report – working with stock summary reports.

UNIT – V: **[6 Hours]**

Working with trial balance report – working with profit and loss a/c report – working with balance sheet report.

Text Book:

1. Business Accounting with MS Excel and Tally Course kit – Vikas Gupta, Dreamtech Press.

Reference Books:

1. Tally 9 - Law Point
2. Tally ERP 9 – Law Point

INVESTMENT AVENUES

Contact Hours per week: 2 **Subject Code: V1BA2**
Contact Hours per Semester: 30

Course Outcomes:
Students, after successful completion of the course, will be able to
CO1: Provide a basic theoretical framework of the concept of investment.
CO2: Impart knowledge about different investment alternatives.
CO3: Understand the essentials of risk and return.

Unit 1: **[6 Hours]**
Investment: Meaning – Objectives - Qualities of successful investing – Approaches to investment decision making – Investor vs Speculator – Investment Alternatives.

Unit 2: **[6 Hours]**
Bank Deposits: Savings Account – Current Account – Fixed Deposits – Recurring Deposits. Government Savings Schemes: PPF Scheme – SCSS – NSC.

Unit 3: **[6 Hours]**
Money Market Instruments: Treasury Bills – Commercial Paper – Certificate of Deposits. Debentures: Meaning – Types. Insurance Products – Types: Term Insurance – Endowment Plan – ULIPs.

Unit 4: **[6 Hours]**
Stock Market Investments: Primary Market – Secondary Market. Mutual Funds: Meaning – Types – Equity Funds – Debt Funds – Hybrid Funds.

Unit 5: **[6 Hours]**
Risk and Return – Meaning – Types of Risks – Diversification and Portfolio Risks. Components of Return: Current Return – Capital Return.

Text Books:
i) Investment Analysis and Portfolio Management – Prasanna Chandra, Tata MC Graw Hill Fourth Edition

ii) Banking theory, law and practive – E.Gordon & K.Natarajan, Himalaya Publishing House.

SECRETARIAL PRACTICE

Contact Hours per week: 2 **Subject Code: V1BA3**
Contact Hours per Semester: 30

Course Outcome:

Students, after successful completion of the course, will be able to
CO 1 : Provide knowledge on types of secretaries and their functions.
CO 2 : Impart Knowledge about functions, rights and powers of secretary
CO 3 : Understand Company Act,1956 and its applicability.
CO4 : Apply Secretarial Practice in their Job.

UNIT – I **[6 Hours]**

Definition of Secretary-Growing Importance of Secretary- Types of Secretaries-Private Secretary and Stenographer- Daily Routine of the Private Secretary.

UNIT– II **[6 Hours]**

Definition of Company Secretary- Appointment of a Company Secretary-Qualities and Qualifications of a Good Company Secretary–Duties of the Secretary.

UNIT– III **[6 Hours]**

Functions of a Company Secretary- Rights of the Secretary-Liabilities- Powers of the Secretary-Legal Position of the Company Secretary.

UNIT– IV **[6 Hours]**

Director as Secretary-Register of Directors, Manager and Secretary-Secretarial Correspondence and Office organization-Company work and the Secretary- Dismissal of the Company Secretary.

UNIT V **[6 Hours]**

The Companies Act, 2013-Applicability of the Act-Special features of the Act-Documents required for registration of a Company-Certificate of Incorporation-Duties of Secretary after Incorporation.

Text Books

1. Manual of Secretarial Practice – B.N.Tandon, S.Chand & Co. Publisher.

Reference Books:

1. Secretarial Practice – M.C.Kuchhal, Vikas Publishing House Private Limited.
2. Secretarial Practice– Khorshed D.P.Madon, Progressive Corporative Pvt.,Ltd.,

Course Name : Bachelor of Science
Discipline : Physics
(For those who Join in 2018 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core	Core 6 - Analog Electronics	4	4	25+75=100	U2PHC51	Employability	Interchanged & Revised 20%
	Core	Core 7 - Physical Optics & Spectroscopy	4	4	25+75=100	U2PHC52	Employability	Interchanged & Revised 55%
	SBS	SBS 3 - Electrical Wiring	2	2	25+75=100	U1PHS51	Entrepreneurship	New
	SBS	SBS 4 - Physics of Human Anatomy	2	2	25+75=100	U1PHS52	Skill Development	New
	Core	NME 1 - Basic Physics	2	2	25+75=100	U2PHN51	Employability	New
	Core	LAB : Core (Major) Lab 3 – General Physics	3	-	-	-	-	-
	Core	LAB : Core (Major) Lab 4 – Electronics	3	-	-	-	-	-
	NME	LAB : Core (Major) - Project & Area Study	2	-	-	-	-	-
	Allied	General Chemistry-III	4	4	25+75=100	U2CHA5X3		
		Employability Skills	2	2	25+75=100	U1PS51	Skill Development	No Change
		LAB: Organic Analysis	2	-	-	-		
VI	Core	Core 8 - Atomic & Nuclear Physics	4	4	25+75=100	U1PHC61	Employability	No Change
	Core	Core 9 - Digital Electronics	4	4	25+75=100	U3PHC62	Employability	Interchanged & Revised 55%
	SBS	Core 10 - Classical & Statistical Mechanics	4	4	25+75=100	U4PHC63	Entrepreneurship	Interchanged & Revised 40%
	SBS	SBS 6 - Biomedical Instrumentation	2	2	25+75=100	U2PHS61	Entrepreneurship	No Change
	Core	NME 2 - Solar Energy	2	2	25+75=100	U2PHN61	Employability	New
	Core	LAB :Core (Major) Lab 3 – General Physics	3	5	40+60=100	U2PHC6P1	Skill Development	Revised 7%
	Core	LAB : Core (Major) Lab 4 – Electronics	3	5	40+60=100	U3PHC6P2	Skill Development	Revised 14%
	NME	Core (Major) - Project & Area	2	5	100	U3PH6PR	Skill Development	No Change

		Study			(Internal only)			(Credit 4 into 5)
	Allied	General Chemistry-IV	4	4	25+75=100	U3CHA6X4		
	Allied	LAB: Organic Qualitative Analysis	2	2	40+60=100	U1CHA6PX 2		

Self-Learning Course:

Semester	Subject	Credit	Ext =Tot	Subject Code
V	Renewable Energy Sources	5	100 = 100	U1PHSL51

COURSE : III B.Sc. PHYSICS **ANALOG ELECTRONICS** Hours : 4
SEMESTER : V CORE PAPER 6 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U2PHC51**

Course Objectives

In this course, the student will

- know about semiconductor principles and mobility of charges in semiconductors
- get knowledge about Diodes and Transistor biasing and their characteristics
- able to know the various applications of diodes in wave shaping circuits and power supplies
- learn about the construction and performance of different transistor amplifiers
- understand the feedback principles and working of oscillators

UNIT I **(12hours)**

Semiconductors : Energy Bands in Solids – Bonds in Solids – Valence and Conduction Bands – Conduction in Solids – Hole Formation and its Movement – Conductors, Semi conductors and Insulators – Types of Semi Conductors – Intrinsic Semiconductors – Extrinsic Semi Conductor – Majority and Minority Charge Carriers – Mobile charge carriers and Immobile ions – Drift current in good conductor – Drift current in Intrinsic Semiconductor.

The P-N Junction : The P-N Junction – Formation of Depletion Layer – Effect of Temperature on Barrier Voltage – Forward Biased P-N Junction – Forward V/I Characteristics – Reverse Biased P-N Junction – Reverse Saturation Current I_s or I_o – Reverse V/I Characteristic – Combined Forward and Reverse V/I Characteristics – Junction Breakdown.

UNIT II **(12hours)**

P-N Junction Diode: P-N Junction Diode – Diode Ratings or Specifications – Diode Testing – The Ideal Diode – The Real Diode – Diode Circuits with DC and AC Voltage Sources – Diode Fabrication – Clipper and Clamper Circuits – Zener Diode – Voltage Regulation.

DC Power Supplies: Rectifiers – Half-wave Rectifiers – Full-wave Rectifiers – Full-wave Bridge Rectifiers – Filters – Series Inductor Filter – Shunt Capacitor Filter – Effect of increasing Filter Capacitance – LC Filter – The CLC or Π Filter.

UNIT III **(12hours)**

The Basic Transistor: The Bipolar Junction Transistor – Transistor Biasing – Important Biasing Rule – Transistor Currents – Transistor Circuit Configurations – CB Configuration – CE Configuration – Relations between α and β – CC Configuration – Relation between Transistor Currents – Leakage Currents in a Transistor – Thermal Runway.

Transistor Characteristics: Transistor Static Characteristics – Common Base Test Circuit – Common Base Static Characteristics – Common Emitter Test Circuit – Common Emitter Static Characteristics – Common Collector Static Characteristics.

Load Lines and DC Bias Circuits: DC Load Line – Q-point and Maximum Undistorted Output – Need for Biasing a Transistor – Factors Affecting Bias Variations – Stability Factor – Beta Sensitivity – Stability Factor for CB and CE Circuits – Different Methods of Transistor Biasing - Base Bias – Base Bias with Emitter Feedback – Base Bias with Collector Feedback – Base Bias with Collector and Emitter Feedbacks - Voltage Divider Bias – Load Line and Output Characteristics – AC Load Line.

UNIT IV **(12hours)**

Transistor Equivalent Circuits and Models: h-parameters – The h-parameters Notation for Transistors – The h-parameter of an Ideal Transistor – The h-parameter of an Ideal CB Transistors – The h-parameter of an Ideal CE Transistors - Approximate Hybrid Equivalent Circuits – Typical values of Transistor h-parameters – Hybrid Formulas for Transistor Amplifier.

Single-Stage Transistor Amplifiers: Classification of Amplifiers – Common Base Amplifiers – Various Gains of a CB Amplifier – Characteristic of a CB Amplifiers – Common Emitter Amplifier – Various Gains of a CE Amplifier – Characteristic of a CE Amplifier – Common Collector Amplifier – Various Gains Of a CC Amplifier – Characteristic of a CC Amplifier – Uses – Comparison of Amplifier Configuration – Graphical Representation – Transformer –coupled Class-A Amplifiers – Class-B Push-Pull Amplifier.

UNIT V **(12hours)**

Feedback Amplifiers: Feedback Amplifiers – Principle of Feedback Amplifiers – Advantages of Negative Feedback – Gain Stability – Decreased Distortion – Increased Bandwidth – Forms of Negative Feedback.

Sinusoidal Oscillators: Oscillator – Comparison Between an Amplifier and Oscillator – Classification of Oscillators – Damped and Undamped Oscillators – The Oscillatory Circuit – Frequency of Oscillatory Current – Frequency Stability of an Oscillator – Essentials of a Feedback LC Oscillator – Hartley Oscillator – Colpitts Oscillator – Phase Shift Oscillator.

Books for study:

"Basic Electronics: Solid State", B.L. Theraja, S.Chand & Company Ltd., 5th Edition Reprint 2010.

Unit I Chapter – 12: 12.18 – 12.29;
Chapter – 13: 13.1 – 13.11.

Unit II Chapter – 14: 14.1 – 14.17;
Chapter – 15: 15.1 – 15.2;
Chapter – 17: 17.5 – 17.14.

Unit – III Chapter – 18: 18.1 – 18.13;
Chapter – 19: 19.1 – 19.6;
Chapter – 20: 20.1 – 20.15.

Unit – IV Chapter – 21: 21.14 – 21.21;
Chapter – 22: 22.1 – 22.14; 22.20; 22.24.

Unit – V Chapter – 25: 25.1 – 25.7;
Chapter – 28: 28.1 – 28.8; 28.12; 28.14; 28.22.

Reference Books:

1. S. Salivahanan, and N. Suresh Kumar. ***Electronic Devices and Circuits***, New Delhi: Tata McGraw - Hill; 2016. 4th Edition.
2. V.K Metha,. Principle of Electronics New Delhi: S. Chand & Company LTD; 2012. 10th Edition.

COURSE : III B.Sc. PHYSICS **PHYSICAL OPTICS & SPECTROSCOPY** Hours : 4
SEMESTER : V CORE PAPER 7 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U2PHC52**

Course Objectives

In this course, the student will

- know about the properties of lenses and working of system of lenses
- get knowledge of interference, theory of interference and experiments using interference
- get knowledge of diffraction principle and its types
- understand the different kinds of spectroscopic techniques and their applications

Unit I -Geometrical Optics (12hours)

Principal focus and Focal plane of Lens - Equivalent focal length of a system of two thin lenses in contact –separated by a distance- Aberrations in lenses- spherical aberration-reducing spherical aberration-chromatic aberration (longitudinal and lateral)- achromatic combination (lenses in contact and separated by a Finite distance)– Aplanatic lens.

Unit II- Physical optics – Interference (12hours)

Condition for interference- Coherent sources- Theory of Interference fringes- Colours of thin film (interference by reflected light only) - Air wedge – determination of diameter of thin wire- test for optical flatness- Newton's Rings-determination of refractive index of a liquid – Michelson's interferometer-uses - Theory of Holography.

Unit III – Diffraction (12hours)

Fresnel and Fraunhofer diffraction – Rectilinear propagation of light- Zone plate-Theory – comparison with convex lens- Fraunhofer diffraction at a single slit – double slit – Plane transmission grating –theory and experiment to determine wavelength –resolving power – resolving power of grating – resolving power of prism.

Unit IV- Polarization **(12hours)**

Polarization of light - Double refraction – Huygen's explanation of double refraction in uniaxial crystals- Nicol prism – Nicol prism as polarizer and analyzer- Plane, elliptical and circularly polarized light –Production and detection-Optical activity – Biot's law- Fresnel's theory of optical rotation- Laurent's half –shade Polarimeter- Determination of Specific Rotation of Sugar solution.

Unit V- Spectroscopy **(12hours)**

Electromagnetic spectrum- Types of molecular energies- Different spectroscopic methods an overview- spectral line width – Absorption and emission of radiation – Einstein 's coefficients-Infrared and Ultraviolet Spectroscopy – sources- detection- applications- Raman effect-experimental study- Quantum theory of Raman effect-Applications.

Books for study

1. Optics and spectroscopy – R.Murugeshan, Kiruthiga Sivaprasath, 8th revised edition, 2012, S. Chand & Company Ltd. Ram Nagar, New Delhi-110055.
   Unit I - 1.1-1.4, 1.15- 1.22
   Unit II - 2.1, 2.2, 2.5-2.12, 9.1 – 9.3

   Unit III – 3.1-3.5, 3.10-3.12, 3.23, 3.24
   Unit IV – 4.1, 4.5 – 4.8, 4.14-4.12

2. Molecular Structure and Spectroscopy – G. Aruldhas, Second edition, 2011- Prentice-Hall of India Private Ltd. New Delhi – 110 001
   Unit V - 1.1 – 1.6
3. Optics and spectroscopy – R.Murugeshan, Kiruthiga Sivaprasath, Eighth revised edition, 2012, S. Chand & Company Ltd. Ram Nagar, New Delhi-110055.
   Unit V - 5.2, 5.3, 5.5 – 5.8

Reference Books

1. A Textbook of Optics – N.Subrahmanyam & Brijilal , Twenty Fourth edition, 2010- S.Chand & Company Ltd.
2. Fundamentals of Optics – Devraj Singh, Second edition, 2015-PHI Learning Private Ltd. New Delhi.

COURSE : III B.Sc. PHYSICS **ELECTRICAL WIRING** Hours : 2
SEMESTER : V SKILL BASED PAPER 3 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U1PHS51**

Course objectives

In this course, the student will

- understand the basics of AC circuits.
- learn about Electrical Installations.
- acquire the knowledge of Design of Simple Electrical Circuits.
- Will know about the guidelines for sub-circuits, fittings and Simple Wiring Schemes
- know about electrical protective devices and electrical estimation.

Unit I – Basic Concepts **(6 Hours)**

Ohm's law – Kirchhoff's law – Biot-Savart Law - Electromagnetic induction: Faraday's law – Lenz's law - Superposition theorem – Thevenin theorem – Norton's theorem - Reciprocity theorem –Star-Delta conversion.

Unit II – Design Considerations of Electrical Installations **(6 Hours)**

Electric supply system – Three Phase four wire distribution system – Protection of electric installation against overload, short circuit, earth fault and electric shock – Single phase supply – Three phase, four wire supply - Neutral and Earth wire

Unit III - Electrical Wiring **(6 Hours)**

Introduction - List of Symbols - Supply Voltages- Service Connection - Interior wiring- Guidelines for sub-circuits and fittings - Simple Wiring Schemes -Two way control of lamps -Three way control of lamps.

Unit IV - Design of Simple Electrical Circuits **(6 Hours)**

Electrical diagram – Methods of Representation for wiring diagram – Introduction to simple light and fan circuits – System of connection of appliances and accessories –Solved examples of light and fan circuits–Alarm circuits with relays.

Unit V - Electrical protective devices and Electrical estimation **(6 Hours)**

Fuses- Miniature circuit breaker (MCB)- Earth Leakage Circuit Breaker (ELCB) - Earthing- Computation of Energy consumed

Books for study

1. "**Basic Electrical Engineering**" by K. Uma Rao and A.Jayalakshmi, Sanguine Technical Publishers, Bangalore. 2014
   Unit I – 1.3, 1.5, 2.2.1, 2.7, 2.7.1, 2.7.2, 3.6-3.8, 3.10, 3.11
   Unit III – 6.1 – 6.9
   Unit V – 6.11 – 6.15

2. "**Electrical Design Estimating and Costing**" by K. B. Raina and S.K. Bhattacharya, New Age International (P) Ltd Publishers, New Delhi, 2007
   Unit II – 4.1-4.3.3, 4.3.5, 4.5.7, 4.5.8, 4.8
   Unit IV–1.3, 1.4, 2.1, 2.2, 2.3, 2.7

Reference Books

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012
2. Uppal S.L, "Electrical Wiring - Estimating and Costing", Khanna Publishers, Sixth edition 2011

COURSE : III B.Sc. PHYSICS **PHYSICS OF HUMAN ANATOMY** Hours : 2
SEMESTER : V SKILL BASED PAPER 4 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U1PHS52**

Course objectives

In this course, the student will

- understand the biophysics of muscles and bones
- know the physics of audition and abut human ear
- understand the functioning of Retina and photoreceptors of eye
- learn about neuro biophysics and function of nerve system

Unit I **(6 Hours)**

Biomechanics: Biostatics - Biophysics of muscle – Muscle power – Strength of bones – Biodynamics – Locomotion on land

Unit II **(6 Hours)**

Physics of audition: Transverse and longitudinal waves – Physiological characteristics of sound – Human ear – Doppler Effect.

Unit III **(6 Hours)**

Physics of vision: Wave nature of light – Geometrical optics – Refractive power – Retina and photoreceptors – Resolving power of eye – Polarisation and vision

Unit IV **(6 Hours)**

Neurobiophysics: Anatomy of neurons – Physico-chemical nature of membrane potential – Electric analog of membrane

Unit V **(6 Hours)**

Nerve excitation – The action potential – Conduction of action potential – Synaptic transmission

Books for study:

1. "**Elementary Biophysics**", P.K. Srivastava, Narosa Publishing House Pvt. Ltd. Second Edition 2011.

Unit-I Chapter-1: 1.1-1.5.
Unit-II Chapter-4: 4.1-4.3, 4.5.
Unit-III Chapter-5: 5.1-5.4, 5.6, 5.7.
Unit-IV Chapter-11: 11.1-11.3.
Unit-V Chapter-11: 11.4-11.7.

Reference Book:

1. "Biomedical instrumentation" by Dr. M. Arumugam,Anuradha publications, Chennai, 2008 Reprint"
2. Handbook of Biomedical instrumentation by R.S. Khandpur and Raghbir Khandpur, TMH, Second edition,1987
3. Biomedical instrumentation and measurements by R. Ananda Natarajan, PHI India, Second edition,1995

COURSE : III B.Sc. PHYSICS **BASIC PHYSICS** Hours : 2
SEMESTER : V NON MAJOR ELECTIVE 1 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHN51**

Course objectives

In this course, the student will

- get knowledge about the Physics and its scope
- know about the Galaxies, Origin of the Universe and the Solar system
- study brief history and sources of light
- get knowledge about applications of refraction and diffraction of sound and acoustics of buildings
- understand the communication systems and various types of communication

UNIT I : **(6 Hours)**

What is Physics? – Scope and excitement of Physics – Physics, technology and society – Fundamental forces in nature – Nature of physical laws.

UNIT II : **(6 Hours)**

Galaxies – Origin of the Universe – Black Holes – Origin of the solar system – The structure of the solar system – The Sun – The Planets – Origin of the Earth – Some basic feature of the Earth

UNIT III : **(6 Hours)**

Light: Introduction – Brief history – The Sources of light – Properties of light – Dispersion – The velocity of light – Visible range

UNIT IV : **(6 Hours)**

Sound: Introduction - Applications of Reflection of Sound – Megaphone – Applications of diffraction of sound – Acoustics – Factors affecting the architectural acoustics and their remedies – Reverberation – Loudness – Processing – Echoes – Echelon effect – Resonance – Noise – Ultrasonics: Introduction – Properties of ultrasonic waves – Engineering applications.

UNIT V : **(6 Hours)**

Communication: Introduction – What is communication? – Communication process and its components – Types of communication system – Frequency ranges in communication systems – Modulation – need for modulation.

Book for study:

1. Study material prepared by Department of Physics, VHNSN College(Autonomous), Virudhunagar.

Reference Book:

1. History of Planet earth by M.N. Sastri, Himalaya Publishing House, 1993.
2. Allied Physics-II by Dr. Himanshu Kumar, Vayu Education of India, New Delhi, 2009.
3. A text book of Optics by Dr.N. Subrahmanyam Brijlal & Dr.M.N. Avadhanulu, S. Chand, 2010.
4. Principles of Communication by K.S. Srinivasan, Selva publications, 2002.

General Chemistry - III

Hours per week: 4 **Credits: 4** **Subject Code: U2CHA5X3**

Objectives:

- To know the basic requirements of chemical calculations.
- To acquire fundamental knowledge in bonding.
- To gain fundamental knowledge about adsorption, catalysis and co-ordination compounds.
- To study the principles water analysis.

Unit I – Basic chemical calculation **(12 hours)**

Significant numbers – SI Units – Dimensions – Calculation of formula weight – understanding Avogadro number – Mole concept – Mole fraction of the solvent and solute – conversion of grams into moles and moles into grams – Stoichiometric equations. Methods of expressing concentration of the solution – Normality, molarity, molality and mole fraction – Calculations on principle of volumetric analysis.

Unit II – Theories of bonding **(12 hours)**

Types of the chemical bonds: Ionic bond, covalent bond and coordinate bond – Valence bond theory – Valence Shell Electron Pair Repulsion theory – Shapes of CH_4, H_2O and NH_3 molecules – Molecular orbital theory – Bonding and antibonding orbital – MO theory applied to homonuclear molecules – H_2, N_2 and O_2 – comparative study of VB and MO theories.

Unit III – Coordination compounds **(12 hours)**

Introduction – nomenclature – Werner's theory – Coordination number and geometry – EAN rule – Valence Bond theory and Bonding in octahedral and tetrahedral complexes – Low spin and high spin complexes – Crystal field theory (octahedral and tetrahedral splitting only) .

Unit IV – Adsorption and catalysis **(12 hours)**

Adsorption:

Definition of various terms (adsorption, absorption, adsorbent, adsorbate, sorption & desorption) – Difference between adsorption and absorption – Factors affecting the adsorption of gases on solids – Physical and chemical adsorption – Adsorption isotherms (Langmuir & Freundlich basic ideas only) – Applications of adsorption.

Catalysis:

Definition – Characteristics of catalysis – Promoters and poisons – Enzyme catalysis – characteristics of enzyme catalysis (Michaelis-Menton equation only) – Acid-base catalysis and autocatalysis – Applications of catalysis.

Unit V – Water treatment **(12 hours)**

Water quality analysis – Chemical and physical analysis of water quality parameters - Standards prescribed for water quality by WHO and Indian standards – Sea water as a source of drinking water.

Sewage treatment

Sewage – Objectives of sewage treatment – General purification reaction: aerobic and anaerobic process – Methods of sewage disposal (Bio chemical oxidation, chemical precipitation and chlorination process) – Sludge disposal (septic tank treatment and sludge digestion).

Reference Books

Unit-I

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-II

1. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
2. R. Gopalan Textbook of Inorganic Chemistry, Universities Press Pvt. Ltd., 2012.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
4. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.

Unit-III

1. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
2. R. Gopalan Textbook of Inorganic Chemistry, Universities Press Pvt. Ltd., 2012.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
4. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.

Unit-IV

1. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand & Co., 2004.
2. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-V

1. A.K.De, Environmental Chemistry (seventh edition), New Age International Publishers New Delhi, 2010.
2. M.M.Uppal, A Text book of Engineering Chemistry, Khanna Publishers, New Delhi 1988.

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**

Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **(6-hours)**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**

Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**

Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**

General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal

4. Malayala Manorama Year Book, 2014

COURSE : III B.Sc. PHYSICS **ATOMIC AND NUCLEAR PHYSICS** Hours : 4
SEMESTER : VI CORE PAPER 8 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U1PHC61**

Course Outcomes :

In this course, the student will

- understand atom models.
- study the quantum mechanical explanation for the atom model.
- study the nuclear composition and its properties
- understand the nuclear structure.
- understand the Nuclear fission and fusion.

UNIT I **(12hours)**

Introduction – Rutherford's experiments on scattering of α particles – Bohr atom model – Effects of Nuclear motion on atomic spectra – Evidence in favour of Bohr's theory – Critical potential – Atomic excitation – Sommerfeld's relativistic atom model: Elliptic orbits for hydrogen – Total energy – Sommerfeld's relativistic theory – Fine structure of Hα line. The vector atom model: spatial quantization – Spinning electron – Quantum numbers associated with the vector atom model – Coupling schemes – The Pauli Exclusion Principle – Some Examples of Electro configuration with their modern symbolic representations.

UNIT II **(12hours)**

Zeeman effect – Lorentz Classical theory of normal Zeeman effect – Quantum mechanical explanation of the normal Zeeman effect – Anomalous Zeeman effect – X rays: Introduction – production of X-rays – X-ray spectra – Characteristic X-ray spectrum – Moseley's law – Compton scattering: theory and experimental verification.

UNIT III **(12hours)**

Introduction to the nucleus – Classification of nuclei – General properties of nucleus – Binding energy – Nuclear stability – Theories of nuclear composition – Nuclear forces – Meson theory of nuclear forces.

UNIT IV **(12hours)**

Models of nuclear structure – The liquid drop model – The shell model – The collective model – Determination of nuclear radius: mirror nuclei method – Fermi gas model of the nucleus.

UNIT V **(12hours)**

Nuclear fission and fusion: Discovery – Nuclear fission – Energy released in fission – Bohr and Wheeler's theory of nuclear fission - Chain reaction – Critical size for maintenance of chain reaction - Atom bomb – Nuclear reactors – Nuclear fusion –Source of stellar energy – Thermonuclear reactions – Controlled thermonuclear reaction.

Books for study:

1. Modern Physics – R. Murugeshan, Er. Kiruthiga Sivaprasath, 2013, 17th Edition S. Chand & Co Ltd..

Unit I: 6.1, 6.2, 6.4 - 6.6, 6.8 - 6.9, 6.11 - 6.15, 6.17
Unit II: 6.23, 6.25, 6.26, 7.1, 7.2, 7.11 – 7.14

Unit III: 27.1 - 27.8
Unit IV: 27.9 – 27.13, 28.6
Unit V: 35.1 – 35.9

Reference Books:

1. Modern Physics – Seghal Chopra & seghal sultan, Chand, 1998.
2. Atomic and Nuclear Phyics – N. Subramanyan & Birijlal, S.Chand & Co, 2000

COURSE : III B.Sc. PHYSICS **DIGITAL ELECTRONICS** Hours : 4
SEMESTER : VI CORE PAPER 9 Credit : 4
Contact hours per Week – 4 hours
Contact hours per Semester – 60 hours **Subject Code: U3PHC62**

Objectives

To understand different number systems and Boolean algebra.

- To get knowledge about different logic gates.
- To study the different arithmetic circuits.
- To understand the functioning of flip-flops, counters and Registers.

UNIT - I: (12hours)

Number Systems and Codes: Binary number system – Binary to decimal system – Decimal to binary conversion – Octal numbers and it's conversion – hexadecimal numbers and it's conversion– ASCII code – Excess 3 code – Gray code.

UNIT - II: (12hours)

Logic gates: Introduction – The basic gates OR, AND, NOT – TTL logics – Universal logic gates -NAND, NOR- TTL logic – Positive and negative logic.
Combinational logic circuits: Boolean laws and theorems – Sum of products method –Truth table to Karnaugh map – Pairs, quads, and octets – Karnaugh simplification – Don't-care conditions – Product of sum method – Product of sum simplification

UNIT – III (12hours)

Arithmetic Circuits: Binary addition – Binary subtraction – unsigned binary numbers-sign-magnitude numbers – 2's complement representation – 2's complement arithmetic – Arithmetic Building Blocks – The adder- Subtracter – Arithmetic logic units – Binary multiplication and division.

UNIT - IV: (12hours)

Data processing circuit: Introduction – Multiplexers – 16 to 1 multiplexer – Demultiplexers – 1 to 16 Demultiplexers – 1 of 16 Decoder – BCD to decimal decoder – Seven-Segment decoder- Encoders.
Flip flops: RS flip flops – Gated flip flops –Edge triggered RS flip flops – Edgetriggered D

flip flop – Edge triggered JK flip flop– JK master slave flip flop.

UNIT – V (12hours)

Registers: Types of Registers – Serial in - Serial out Shift Registers – Serial in – Parallel out and parallel in – serial out shift registers.

Counters: Asynchronous counter – Synchronous counter – decade counters (Mod-5 counter, mod -10 counter)

Books for study:

1. Digital Principles and Applications by Donald Leach, Albert Paul Malvino, Goutam Saha, Tata Mc Graw Hill, (2011) Seventh Edition.

Unit:1 5.1-5.7
Unit:2 2.1-2.4, 3.1- 3.8.
Unit:3 6.1 – 6.8
Unit:4 4.1-4.6,8.1-8.5,8.6
Unit:5 9.1-9.4,10.1,10.3,10.5

Reference Books

1. Basic Electronics and Applied Electronics by Jose Robin and Ubald Raj, Indira Publications (2004).
2. An Introduction to Integrated Electronics by V.Vijeyandran, Viswanathan, S., Printers & Publishers Pvt Ltd, 2009
3. Digital Logic Circuits by Salivahanan, Arivazhahan. Published by Vikas Publishing House Pvt Ltd 2012.

COURSE : III B.Sc. PHYSICS **CLASSICAL AND STATISTICAL MECHANICS** Hours : 4

SEMESTER : VI CORE PAPER 10 Credit : 4

Contact hours per Week – 4 hours

Contact hours per Semester – 60 hours **Subject Code: U4PHC63**

Course objectives:

In this course, the student will

- understand the basic concepts classical mechanics.
- get knowledge about D'Alemberts principle and its applications
- Will know the superiority of Lagrangian mechanics over Newtonian Approach.
- understand the fundamental postulates and distribution laws of statistical mechanics.

UNIT – I **(12hours)**

Space and Time – Inertial frames – Mechanics of a particle: Conservation of linear momentum – Conservation of angular momentum – Conservation of energy – Mechanics of a system of particles: Conservation of linear momentum – Conservation of angular momentum – Conservation of energy – Constraints – Degrees of freedom under constraints – Forces of constraint – Difficulties introduced by the constraints and their removal.

UNIT – II **(12hours)**

Generalized coordinates – Principle of virtual work – D'Alemberts principle – Lagrange's equations from D'Alemberts principle – Applications (Simple Pendulum, Compound Pendulum, Atwood's Machine) – Lagrange's equations in presence of Non-conservative forces – Hamilton's Principle and Lagrange's equations – Superiority of Lagrangian mechanics over Newtonian Approach.

UNIT – III **(12hours)**

Generalized momentum and cyclic coordinates – Hamiltonian function H – Physical significance – Hamilton's equations – Hamilton's equations in different coordinate system – Simple applications (Harmonic oscillator, motion of a particle in a central force field, Compound Pendulum)

UNIT – IV **(12hours)**

Statistical basics- Probability - Principle of equal A priori probability - some basic rules of probability theory- Permutations and combinations-Microstates and microstates-Thermodynamic probability- constraints on a system-static and dynamic systems-most probable state – life time of micro and macro states-Concept of cell in a compartment-Ensemble and average properties.

UNIT – V **(12hours)**

Degrees of freedom-Position space- Momentum space- Phase Space- The mu-space and Gamma space- Division of phase space into cells-Applications-Fundamental postulates of statistical mechanics-Statistical ensembles- Canonical ensemble-Grand canonical ensemble-Comparison of Ensembles-Theories based on statistical mechanics-Entropy and probability-Boltzmann's canonical distribution law-Application of Boltzmann's canonical distribution law.

Books for study:

1. Classical Mechanics – J.C. Upadhyaya, reprint 2012, Himalaya Publishing House.
   Unit I: 1.2, 1.4, 1.6, 1.7, 2.3
   Unit II: 2.4 – 2.7, 2.9, 2.11, 2.12
   Unit III: 3.2, 3.4 – 3.7
2. Heat Thermodynamics and Statistical Physics, Brijlal, Dr.N.Subramanyam, P.S.Hemne S.Chand& Company LTD, reprint 2012.
   Unit IV: 9.1- 9.3, 9.5-9.8, 9.10-9.15
   Unit V: 10.1-10.8, 10.10, 10.11, 10.14-10.17

Reference Books:

1. Introduction to Classical Mechanics by R.G.Takawale and P.S.Puranik, Tata Mc-Graw Hill Publishing Company Limited, New Delhi.1988.
2. Statistical Mechanics – R.K. Srivastava, J.Ashok, 2010, PHI.
3. Fundamentals of Statistical Mechanics – B.B. Laud, 2009, New age International Publishers.
4. Modern Physics – R. Murugeshan, Er. Kiruthiga Sivaprasath, 2013, 17th edition, S. Chand & Company pvt. Ltd.

COURSE : III B.Sc. PHYSICS **BIO MEDICAL INSTRUMENTATION** Hours : 2
SEMESTER : VI SKILL BASED PAPER 6 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHS61**

Course objectives:

In this course, the student will

- get idea about design of medical instruments and components of the Biomedical instrument system
- get knowledge about characteristics of bio potential recording system
- understand the operation and uses of ECG and EEG equipments
- understand the application of Lasers and Computers in the field of medicine

Unit I **(6 Hours)**

Design of medical instruments – Componenets of the Biomedical instrument system – Electrodes- Half cell potential – Purpose of electrode paste- Types of electrodes – Transducers–Active transducers – Magnetic induction type transducers – Piezoelectric type transducers

Unit II **(6 Hours)**

Biopotential recorders – Characteristics of recording system – Writer and Pen damping system –Electrocardiography – Origin of cardiac potential – ECG lead configurations – Practical considerations for ECG recording

Unit III **(6 Hours)**

Electroencephalography – Origin of EEG – Brain waves–Placement of electrodes – Recording setup – Analysis of EEG

Unit IV **(6 Hours)**

Computers in medicine – Lasers in medicine – Endoscopes

Unit V **(6 Hours)**

Computer Tomography – Magnetic resonance Imaging – Magnetic resonance phenomenon - Magnetic resonance spectroscopy *in vivo* – Magnetic resonance imaging

Books for study:

1. "**Biomedical instrumentation"** by Dr. M. Arumugam,Anuradha publications, Chennai, 2008 Reprint"

Unit I: Chapter II – Sections 2.2, 2.3, 2.4 (2.4.1 - 2.4.3), 2.4.4, 2.5 (2.5.1-2.5.3)
Unit II: Chapter IV – Sections 4.2, 4.2.1, 4.3 (4.3.1, 4.3.2, 4.3.4)
Unit III: Chapter IV – Sections 4.4, 4.4.1 – 4.4.5)
Unit IV: Chapter X – Sections 10.2, 10.3, 10.4
Unit V: Chapter X – Sections 10.7, 10.10, 10.10.1- 10.10.3

Reference Book:

4. Handbook of Biomedical instrumentation by R.S. Khandpur and Raghbir Khandpur, TMH, Second edition,1987
5. Biomedical instrumentation and measurements by R. Ananda Natarajan, PHI India, Second edition,1995

COURSE : III B.Sc. PHYSICS **SOLAR ENERGY** Hours : 2
SEMESTER : VI NON MAJOR ELECTIVE 2 Credit : 2
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHN61**

Course objectives:

In this course, the student will

- get knowledge about the Energy Sources
- understand the Solar Energy Basics
- study the different types Solar collectors
- know about structure and working of Solar water heaters
- study the solar dryer, solar distillation and solar thermo-mechanical systems

UNIT I : **(6 Hours)**

Energy Sources: Introduction – Energy growing needs and world sources – Classification of energy resources – Non-Renewable energy resources – Renewable energy resources.

UNIT II : **(6 Hours)**

Solar Energy Basics: The Sun as a source of energy – The Earth – Extraterrestrial and Terrestrial Radiations – Spectral energy distribution of solar radiation – Depletion of solar radiation – measurements of solar radiation.

UNIT III : **(6 Hours)**

Solar Collectors: Classification – Comparison of concentrating and non-concentrating types of solar collectors – performances indices – liquid flat-plate collector – flat-plate Air heating collector – Evacuated tube collector – Modified flat-plate collector – compound parabolic concentrator – cylindrical parabolic concentrator – Fixed mirror solar concentrator – paraboloidal dish collector – central tower receiver.

UNIT IV : **(6 Hours)**

Solar Water Heater – Solar passive space heating and cooling systems – solar industrial heating systems – solar refrigeration and air-conditioning systems

UNIT V : **(6 Hours)**

Solar dryer – Solar distillation – Solar thermo-mechanical systems - solar thermal water pump – solar vapour compression refrigeration – solar-pond electric-power plant – Alternative types of slolar ponds – central tower receiver power plant – solar chimney plant.

Book for study:

1. Study material prepared by Department of Physics, VHNSN College (Autonomous), Virudhunagar.

Reference Books:

1. Non-Conventional energy resources by B H Khan, Mc Graw Hill, 2011
2. Solar energy Fundamentals, Design, Modelling and Applications by G.N. Tiwari, Narosa Publishing House, 2016
3. Solar Energy Utilization by G D Rai, Khanna Publishers, New Delhi, 2012

COURSE : III B.Sc. PHYSICS **GENERAL PHYSICS** Hours : 3
SEMESTER : V & VI Core Lab (Major) Credit : 5
Contact hours per Week – 3 hours
Contact hours per Semester – 30 hours **Subject Code: U2PHC6P1**

1. Determination of Refractive Index of the given Small angled prism using Spectrometer.
2. Determination of Refractive Index of the given prism by I – I' curve method using Spectrometer.
3. Determination of number of lines per meter of the grating (N) and wavelength (λ) of prominent lines of the mercury spectrum by minimum deviation method using Spectrometer.
4. Determination of Resolving Power of a grating using Spectrometer.
5. Determination of the wavelength (λ) of prominent lines of the mercury spectrum using Hartmann's interpolation using Spectrometer.
6. Study the frequency current relationship of a Series LCR circuit.
7. Study the frequency current relationship of a Parallel LCR circuit.
8. Determination of Self inductance of the coil using Maxwell's bridge (AC method).
9. Determination of Self inductance of the coil using Owen's bridge (AC method).
10. Determination of Impedance & Power factor using LR circuit.
11. Determination of Impedance & Power factor using CR circuit.
12. Determination of Mutual Inductance of the given coils using Spot Galvanometer.
13. Comparison of Mutual Inductance between two coils using Spot Galvanometer.
14. Determination of High Resistance by leakage method using Spot Galvanometer.
15. Determination of angle of Acceptance and Numerical aperture of the given Fiber optic cable.

COURSE : III B.Sc. PHYSICS **ELECTRONICS** Hours : 3
SEMESTER : V & VI Core Lab (Major) Credit : 5
Contact hours per Week – 3 hours
Contact hours per Semester – 30 hours **Subject Code: U3PHC6P2**

1. Characteristics of Zener diode.
2. Construction and study of Bridge rectifier with π filter.

3. Construction and study of Voltage Doubler and Tripler.
4. Characteristics of Transistor (CE mode).
5. Construction and study of Single Stage Amplifier.
6. Construction and study of Hartley Oscillator.
7. Construction and study of Colpitt Oscillator.
8. Regulated power supply using IC 7805.
9. Verification of De Morgan's Laws.
10. NOR gate as a universal building block.
11. NAND gate as a universal building block.
12. Construction and study of Half Adder and Full Adder circuits using IC's.
13. Construction and study of Integrator and Differentiator circuits using IC 741.
14. Construction and study of Adder and Subtractor circuits using IC 741.
15. Construction and study of R-S & J-K flip flop using gates.

COURSE : III B.Sc. PHYSICS **PROJECT AND AREA STUDY** Hours : 2
SEMESTER : V & VI Credit : 4
Contact hours per Week – 2 hours
Contact hours per Semester – 30 hours **Subject Code: U2PH6PR**

Project and Area Study (only internal Evaluation)

Project

Project Maximum Marks 50 (Passing Minimum 20 Marks)
Project based on basic or applied Physics should be done only in our Lab.
Project report should not exceed 50 Pages.

Area Study

Maximum Marks 50 (Passing Minimum 20 Marks)
Students should visit any Institute or Lab of Scientific importance.
Students should submit a detailed report regarding the visit not exceeding 25 Pages.

General Chemistry - IV

Hours per week: 4 **Credits:4** **Subject Code: U3CHA6X4**

Objectives:

- To study the basics of chemical equilibrium.
- To acquire basic idea about drugs.
- To gain knowledge about the chromatographic techniques.

- To understand the role of bio-organic materials.

Unit I – Chemical equilibrium and Ionic equilibrium in solution (12 hours)

Equilibrium: Definition. Chemical equilibrium – Definition, characterization and equilibrium law, K_p and K_c relation – Le-Chatelier principle – Synthesis of ammonia (Haber process)

Acids, bases and salts – pH- Buffer solution – Solubility equilibria of sparingly soluble salts. Electrolyte: Classification and example – Ostwald's dilution law.

Unit-II- Drugs (12 hours)

Chemotherapy –Anaesthetics – General anaesthetics and local anasethetics (definition and example only). Sulpha drugs (Sulphonamides) - Synthesis and applications of sulpha drugs (sulphanilamide, sulphapyridine, sulphathiazole and sulphadiazine) – Mode of action of sulpha drugs. Antibiotics: Penicillin –Streptomycin- Chloramphenicol (chloromycetin) – Structure and mode of action of these drugs (synthesis not required).

Unit III – Chromatography (12 hours)

Basic principles of common types of chromatography – Paper chromatography – Thin layer chromatography – Column chromatography – Ion exchange chromatography. Applications of each techniques.

Unit IV – Proteins, Nucleic acids, Hormones and Vitamins (12 hours)

Definition – Classification of proteins – Colour reaction of proteins – Nucleic acids – nucleoside – nucleotides and general structure of DNA. Hormones – Classification – structure of some sex hormones – oestrone and progesterone. Vitamins – Classification of vitamins – Sources and deficiency diseases of vitamins A, B_1, C, D, E and K (structure not required).

Unit V – Chemistry of a few useful compounds (12 hours)

Preparation and uses of CH_2Cl_2, $CHCl_3$, CCl_4, CF_2Cl_2, Bleaching powder, Phenyl, Talcum powder, Shampoo, Shave lotion, Soaps and Detergents.

Reference Books

Unit-I

1. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand & Co., 2004.
2. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-II

1. B.S.Bahl and Arun Bahl, A Textbook of Organic Chemistry, S.Chand & Company Ltd, Ram Nagar, New Delhi,16th edition, 2002.
2. K.S.Tewari, N.K.Vishnol and S.N. Mehrotra A Textbook of Organic Chemistry, 3rd revised edition, 2006.
3. P.L.Soni and H.M.Chawla, Textbook of Organic Chemistry, Sultan Chand & Sons, New Delhi, 2007.

Unit-III

1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
2. B.K. Sharma, Instrumental methods of Chemical Analysis, Goel Publishing House 23rd Edition, 2004.

Unit-IV

1. S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co. Ltd., 2008.

2. K.S.Tewari N.K.Vishnol and S.N. Mehrotra A Text book of Organic Chemistry, 3rd revised edition, 2006.
3. Jaya shree Ghosh, Fundamental Concept of Applied Chemistry S.Chand & Company LTD, 2008.

Unit-V

1. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.
2. B.R.Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
3. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
4. P.K.Chattopadhyay, Modern Technology of Soaps, Detergents and Toiletries, 2nd edition, 2005.
5. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 6th edition, 1994.

Part III – Ancillary Lab II – Organic Qualitative Analysis

Hours per week: 2 **Credits: 2** **Subject Code: U2CHA6PX2**

Objective:

- To gain fundamental knowledge about organic analysis

Organic analysis

Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of solid derivative / colour reaction – acids, phenols, aldehydes, ketones, esters, nitro compounds, primary amines, amides, anilides, aliphatic diamide and monosaccharides.

SELF LEARNING

COURSE: B.Sc. PHYSICS **RENEWABLE ENERGY SOURCES** Credit : 5

Subject Code: U1PHSL51 **TOTAL MARKS: 100**

Course Outcomes :

- To get knowledge about Sun as a source of energy
- To study about solar thermal and photovoltaic devices
- To understand the basic concepts of Wind, Biomass and Geothermal energy sources

Unit I

Solar Energy Basics – Introduction – The Sun as a source of energy – The earth – Extraterrestrial and Terrestrial radiations – Spectral distribution of solar radiation – Depletion of solar radiation – Measurements of solar radiation – Solar collectors – Classification – Liquid flat plate collector – Evacuated tube collector – Solar water heater – Box type solar cooker

Unit II

Solar photo voltaic systems – Semiconductors – Solar cell classification – solar cell, Module, Panel and array construction – Solar PV systems – Solar PV applications.

Unit III

Wind energy – Introduction – Global winds – Local winds – nature of winds – Wind turbine siting – Major applications of wind power – Horizontal axis wind turbine – Environmental aspects – Wind energy programme in India

Unit IV

Biomass Energy – Introduction – useful forms of biomass, their composition and fuel properties – Biomass resources – Biomass gasification – Downdraft type – Updraft type –

Biogas production from waste biomass – Availability of raw materials and gas yield - Biomass energy programme in India

Unit V

Geothermal energy – Introduction – Applications – Origin and distribution of geothermal energy – Tidal energy - Origin and nature of tidal energy – Limitations of tidal energy – Ocean thermal energy – Origin and characteristics of resource - Ocean thermal energy conversion technology.

Book for study:

Non-Conventional Energy resources, B.H.Khan, McGraw Hill, 2nd edition, 2009

Unit I : Section 4.1, 4.2, 4.4 – 4.7, 5.1, 5.1.1, 5.1.4, 5.1.7, 5.2 & 5.6.1
Unit II : Section 6.1, 6.3, 6.4, 6.8 & 6.9
Unit III: Section 7, 7.1.1, 7.1.2, 7.2, 7.2.1, 7.3, 7.4, 7.7.1, 7.12 & 7.13
Unit IV: Section 8, 8.2, 8.3, 8.6, 8.6.1, 8.6.2, 8.9, 8.9.6 & 8.11
Unit V : Section 9, 9.1, 9.2, 10.1, 10.1.1, 10.1.2, 10.3, 10.3.1, 10.3.2

Books or reference:

1. Non Conventional energy sources, G.D. Roy, Khanna publications
2. Solar energy utilization, G.D.Roy, Khanna publications

Course Name : Bachelor of Science
Discipline : Chemistry
(For those who Join in 2018 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship / Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core	Core Subject V – Organic Chemistry I	4	4	25+75= 100	U3CHC51	Employability	30% Revised
	Core	Core Subject VI – Physical Chemistry I	4	4	25+75= 100	U3CHC52	Employability	15% Revised
	Core	Core Subject VII – Inorganic Chemistry I	4	4	25+75= 100	U3CHC53	Employability	10% Revised
	Core Lab	Core III – LAB: Organic Preparations and Gravimetric Estimations	3	-	---	---	Skill Development	No Change
	Core Lab	Core IV – LAB: Organic Analysis and Organic Estimations	3	-	---	---	Skill Development	No Change
	Core Lab	Core lab V – Physical Chemistry experiments	2	-	---	---	Skill Development	No Change
	Allied	Allied II (Physics)Electricity and Electronics	4	4	25+75= 100	U1PHA5X3		
	Allied	Allied II - LAB (Physics)	2	-	---	---		
	SBS	Skill Based Subject V – Employability Skills	2	2	25+75= 100	U1PS51	Skill Development	No Change
	NME	Non Major Elective I –Chemistry in day-to-day life	2	2	25+75= 100	U3CHN51	Employability	20% Change

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
VI	Core	Core Subject VIII – Organic Chemistry II	4	4	25+75= 100	U2CHC61	Employability	25% Revised
	Core	Core Subject IX – Physical Chemistry II	4	4	25+75= 100	U3CHC62	Employability	10% Revised
	Core	Core Subject X – Inorganic Chemistry-II	4	4	25+75= 100	U3CHC63	Employability	20% Revised
	Core Lab	Core III – LAB: Organic Preparations and Gravimetric Estimations	3	4	40+60= 100	U1CHC6P1	Skill Development	No Change
	Core Lab	Core IV – LAB: Organic Analysis and Organic Estimations	3	4	40+60= 100	U1CHC6P2	Skill Development	No Change
	Core Lab	Core V – LAB: Physical Chemistry experiments	2	4	40+60= 100	U2CHC6P3	Skill Development	No Change
	Allied	Allied II (Physics) Optics, Spectroscopy and Modern Physics	4	4	25+75= 100	U1PHA6X4		
	Allied	Allied II- LAB: Physics Practical II	2	2	40+60= 100	U2PHA6PX		
	SBS	Project	2	2	50+50= 100	U1CH6PR	Employability and Skill Development	New

	NME	Non Major Elective II – Industrial Chemistry	2	2	25+75= 100	U2CHN61	Employability	No Change

Self-Learning Course:

Year	Semester	SELF LEARNING COURSE Subject	Credit	Ext= TOT	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
III	V	COSMETICS	5	100=100	U1CHSL51	Entrepreneurship	No Change
III	V	CHEMISTRY COMPETITIVE SKILL DEVELOPMENT COURSE	5	100=100	U1CHSL52	Skill Development	New

SEMESTER-V
ORGANIC CHEMISTRY I

Hours per week: 4 **Credits: 4** **Subject Code: U3CHC51**

Course Outcomes :

Students after Successful completion of the course will be able to

- Gain knowledge on polynuclear hydrocarbons and green chemistry.
- Learn the synthesis of new compounds and their uses.
- Understand the concept of aromaticity and aromatic substitution.
- Impart the knowledge of reaction mechanism and substituent effect to the compound.

Unit-I: Polynuclear aromatic hydrocarbons and Green chemistry: (12 hours)

Isolated system- preparation, properties and uses of biphenyl, triphenylmethane and stilbene. Condensed ring system: synthesis, properties and the structure of naphthalene, anthracene and phenanthrene - preparation, properties and uses of naphthylamines, naphthols, naphthaquinones and alizarin- structural elucidation of alizarin.

Green Chemistry- Twelve principles of Green Chemistry- Green solvents.

Unit-II: Derivatives of benzene: (12 hours)

Halobenzenes: Theory of orientation and reactivity - general preparation – properties - uses. Electrophilic and nucleophilic aromatic substitution reactions (Benzyne mechanism) - mechanisms.

Hydroxybenzene: Acidic character of phenols - effect of substituents on acidity of phenols - mechanism of Reimer -Tiemann reaction, Kolbe reaction- preparation of cresols, catechol, resorcinol, quinol and eugenol.

Aromatic nitro compounds: Preparation and properties of nitrotoluenes - reduction in different medium.

Aromatic amino compounds: - preparations - effect of substituents on the basic character of aromatic amines - comparison between aliphatic and aromatic amines.

Unit-III: Aromatic carbonyl compounds (12 hours)

Aldehydes and ketones: Nomenclature - structure of carbonyl compounds - General method of preparation and properties of aldehydes and ketones. Preparation, properties and uses of cinnamaldehyde – coumarin - vanillin, Michler's ketone, benzoquinones, Quinone's - nitroso oxime tautomerism. Phenolic ketones- phloroacetophenone - Houben-Hoesch synthesis.

Mechanism of Perkin's reaction, Claisen reaction, Cannizzaro reaction, Knoevenagel reaction, Benzoin condensation and Gattermann aldehyde synthesis.

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Unit-IV: Aromatic carboxylic acids (12 hours)

Aromatic carboxylic acids - Nomenclature - structure of carboxylic acid - General methods of preparation and properties of carboxylic acids - effect of substituents on acidic character. Preparation, properties and uses of phenylacetic acid, mandelic acid, cinnamic acid, phthalic acid, isophthalic acid and terephthalic acid.

Substituted acids - preparation, properties and uses of salicylic acid, aspirin, anthranilic acid. Aromatic sulphonic acids: preparation and uses of benzene sulphonic acid, saccharin, chloramine-T and dichloramine-T.

Unit-V: Organic synthesis (12 hours)

Active methylene compounds: Introduction - Preparation, properties and synthetic applications of active methylene compounds such as acetoacetic ester and dimethylmalonate.

Organometallic compounds: Introduction. Preparation, properties and synthetic applications of - Grignard reagent.

Preparation and synthetic applications of benzene diazonium chloride.

References:

Unit I to V

1. I.L. Finar, Organic Chemistry Vol.I ELBS, 6th edition, 1973.
2. R.T. Morrison and R.W.Boyd, Organic Chemistry, Prantice Hall of India private Ltd, 6 th edition, 2001.
3. P.L.Soni, Organic Chemistry, Sultan Chand & Sons, New Delhi, 29th edition,2007.
4 B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd., Ram Nagar, New Delhi, 14th edition,1996.
5. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, Jalandhar-Delhi,4th edition,2013.
6. V. Kumar An Introduction to Green Chemistry, Vishal Publishing Company, Delhi.
7. K. S. Tewari and N. K. Vishoni, A textbook of organic chemistry, III Edition, 2006, Vikas Publishing House, New Delhi.

Physical Chemistry I

Hours per week: 4 **Credits: 4** **Subject Code: U3CHC52**

Course Outcomes:

Students after successful completion of the course will be able to

- Know basic concepts of thermodynamics and its applications to simple systems
- Understand the basic concepts of electrochemistry and their applications
- Acquire the basic knowledge on chemical kinetics and able to apply the principles for the study of simple reactions.
- Impart the skill of applying the principles of chemical and ionic equilibria to solve simple problems.

Unit I: Thermodynamics I (12 hours)

Terms used in thermodynamics - thermodynamic processes- work, energy and heat- First Law – statement – mathematical formulation – internal energy – enthalpy or heat content –

heat capacity at constant volume (C_v) and at constant pressure (C_P) – relationship between C_p and C_v – work done, heat change and enthalpy change for reversible isothermal expansion and compression of an ideal gas – calculation of q, w, ΔE and ΔH for reversible adiabatic expansion of an ideal gas – relation between T, V and P of an ideal gas undergoing adiabatic reversible expansion – application of first law to non ideal gas undergoing reversible isothermal and adiabatic expansion – Joule Thomson effect – Joule Thomson coefficient in the case of ideal and real gases – inversion temperature and its physical significance.

Unit II: Thermodynamics II (12 hours)

Limitations of first law of thermodynamics – spontaneous process – various statements of second law – conversion of heat into work – thermodynamic efficiency – Carnot cycle – refrigeration cycle – Carnot theorem – Kelvin scale of temperature.

Concept of entropy – physical significance of entropy – derivation of the concept of entropy – Helmholtz work function — Gibbs free energy – variation of free energy with temperature and pressure - Maxwell's relations- Thermodynamic equation of states- Criteria for reversible and irreversible processes in terms of ΔS, ΔG, ΔH and ΔA – limitations of these criteria- Gibbs-Helmholtz equation and its applications.

Unit III: Basics of Electrochemistry I (12 hours)

Electrolytic conduction- Faraday's law of electrolysis- conductivities of ions- specific, equivalent and molar conductance- measurement of conductance of electrolytes- variation of conductance with dilution- equivalent conductance at infinite dilution- Ionic mobility- Transport number- determination of transport number- Hittorf's method- moving boundary method- Kohlrausch's law of independent migration of ions and its applications - Debye – Huckel-Onsager equation (Derivation not required)- Applications of conductance measurements - determination of degree of dissociation of weak electrolytes- determination of pH - determination of solubility products of sparingly soluble salts - conductometric titrations.

Unit IV: Chemical kinetics (12 hours)

Terms in chemical kinetics- rate equation- rate constant – order of a reaction and examples for zero, first, second and third order reactions - unit of rate constants- molecularity of reactions- differences between order and molecularity. Derivation of rate constants for zero, first and second order ($2A \rightarrow$ Product) reactions – characteristics of these reactions and examples - pseudo-unimolecular reactions – Experimental determination of order of a chemical reaction – use of differential and intergral rate expressions - half life period method- isolation method. Kinetic study of some specific reactions- Catalytic decomposition of hydrogen peroxide – decomposition of dinitrogen pentoxide. Inversion of cane sugar and acid catalysed hydrolysis of ester.

Unit V: Chemical and ionic equilibria (12 hours)

The law of mass action- Thermodynamic treatment of law of mass action- K_P, K_c and K_x and the relationship among them - van't Hoff reaction isotherm – Temperature dependence of the equilibrium constant : the van't Hoff equation and its integrated form (Derivation and problems)- Le Chatelier's principle.

Dissociation of weak acids and bases- Ostwald's dilution law - Dissociation constant of polybasic acids – Ionic product of water – the pH scale – Common ion effect - Buffer solutions – buffer action – pH of buffer mixtures : Henderson-Hasselbatch equation.

Recommended Books

Unit I, II & V

1. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry, (2003) Vishal Publishing Co., Jalandhar.
2. P.L. Soni, Principles of Physical Chemistry, S. Chand & Co., New Delhi, 1980.
3. B.S. Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co., New Delhi, 2000.
4. S. Glasston, Thermodynamics for Chemists, East-West Press Private Ltd., New Delhi, 1969.
5. J. Rajaram and J.C. Kuriakose, Thermodynamics for students of chemistry, Shoban Lal Nagin Chand & Co., (1986).

Unit III

1 B.Viswanathan, S. Sundaram, R. Venkataraman, K. Rengarajan and P.S. Raghavan, "Electrochemistry-Principles and Applications" S. Viswanathan Printers and Publishers Pvt., Ltd., (2007)
2. D.R. Crow, "Principles and Application of Electrochemistry", Chapmann Hall, London (1988).
3. L.Antropov, "Theoretical Electrochemistry" Mir Publications, Moscow (1972)
4. S.Glasstone, An Introduction to Electrochemistry, East west Press private limited, New Delhi, 2000.

Unit IV

1. K.J. Laidler, Chemical Kinetics, 3rd Edn., Harper International Edn., London (1987).
2. K.J. Laidler, Theories of Chemical Reaction Rates, McGraw Hill Book Co., London (1969).
3. C. Kalidas, Chemical Kinetic Methods, New Age International, 1996.

Part III Core subject VII – Inorganic Chemistry I

Hours per week: 4 **Credits: 4** **Subject Code: U3CHC52**

Course Outcomes :

Students after successful completion of the course will be able to

- Learn the students to understand the d-block elements.
- Understand the basics of co-ordination chemistry.
- Acquire knowledge on acid – base concepts.
- Understand the basics of error analysis for analytical chemistry.

Unit I: d-Block elements I (12 hours)

General characteristics of d-block elements: Metallic character and related properties, variable oxidation states, colour of transition metal complexes and magnetic properties.

Comparative studies of Group IV(B) elements Ti, Zr and Hf - Extraction, properties and uses of titanium - Preparation and uses of TiO_2 and $TiCl_4$.

Comparative studies of Group V(B) elements V, Nb and Ta - Extraction, properties and uses of vanadium - compounds of vanadium.

Unit II: d-Block elements II (12 hours)

Comparative studies of Group VI(B) elements Cr, Mo and W – Extraction and uses of chromium, compounds of chromium - Lead chromate, basic lead chromate and basic zinc chromate.

Comparative studies of Group VIII elements Fe, Co and Ni. Extraction, preparation and uses Cobalt. Preparation and uses of sodium cobaltnitrite. Platinum - Extraction, properties and uses – Preparation and uses of platinised asbestos, spongy platinum, platinum black. Colloidal platinum and potassium choloroplatinate.

Comparative study of Cu, Ag and Au. Comparative study of Zn, Cd and Hg.

Unit III: Coordination Chemistry (12 hours)

Introduction – double salts – coordination compounds – coordination number – ligands – Types of ligands. Nomenclature of coordination compounds. Isomerism in coordination compounds – structural isomerism and stereoisomerism. Werner's theory-Sidgwick theory, EAN rule. Valence Bond Theory (VBT) in inner and outer d-orbital of octahedral complexes, tetrahedral and square planar complexes - limitations of VB theory. Crystal Field Theory (CFT): low spin and high spin octahedral and tetrahedral complexes - magnetic properties.

Unit IV: Acids, bases and non-aqueous solvents (12 hours)

Arrhenius concept – Bronsted-Lowry concept - conjugate acid-base pair - Amphiprotic substances - levelling effect - Lux-Flood concept – Lewis concept- Relative strength of acids and bases: substituent effect- steric effect - F-strain - Usanovich concept- HSAB concept.
Classification of solvents – non- aqueous solvents - chemical reactions in liquid ammonia: precipitation reactions- Acid- base reactions - complex formation reactions - Ammonolysis reactions - protolysis reaction - solvation reaction - metal-ammonia solution and their reactions.

Unit V: Error analysis and curve fitting (12 hours)

Accuracy – precision – errors- absolute error - relative error - classification of errors - minimisation of errors - significant figures - rules for identifying significant figures – statistical treatment of data: Range, average, median, deviation, mean deviation, relative mean deviation, standard deviation, variance, linear regression and correlation co-efficient. Rejection of experimental data - Q-test - Student's t-test - Analysis of experimental results – graphical method – linear curve fitting - least square method (straight line equation).

Reference Books

Unit-I

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II,S.Chand & Co., New Delhi, Revised reprint 2013.
3. P. L. Soni and M. Katyal, Textbook of Inorganic Chemsitry, Sultan Chand and Sons, New Delhi.

Unit-II

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II,S.Chand & Co., New Delhi, Revised reprint 2013.

Unit-III

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.

2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
3. R. Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Private Limited, New Delhi, 2010.

Unit-IV

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II,S.Chand & Co., New Delhi, Revised reprint 2013.

Unit-V

1. Vogel's Text Book of Quantitative Chemical Analysis, V Edition, ELBS, 1989.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.

COURSE : ALLIED PHYSICS SEMESTER : V	**ELECTRICITY & ELECTRONICS**	Hours : 4 Credit : 4

Subject Code: U1PHA5X3

UNIT - I:

Gauss's law – Proof – Applications – Field due to a charged sphere and an infinite plane sheet – Field near a charged conducting cylinder – Coulomb's theorem – Electric potential – Relation between potential and field – Capacitors – Expression for capacity of parallel plate, spherical (outer sphere earthed) and cylindrical capacitors – Energy of charged capacitor – Loss of energy due to sharing of charges.

UNIT - II:

Kirchoff's laws – Application of Wheatstone's network – Sensitveness of bridge – Carey Foster's bridge – measurement of resistance and temperature coefficient of resistance – Principle of potentiometer – Calibration of ammeter and voltmeter (low range and high range) – measurement of resistance using potentiometer.

UNIT - III:

Torque on a current loop – Mirror galvanometer – dead beat and ballistic – current sensitiveness – B.G theory – damping correction – expression for charge sensitiveness – comparison of e.m.f's and comparison of capacitors.

Electromotive force generated in a coil rotating in a uniform magnetic field – R.M.S and mean value of alternating current – LCR circuit – impedances – Series and Parallel resonant circuits – power factor – wattles current – choke.

UNIT - IV:

Junction diodes – Forward and reverse bias – Diode characteristics – Types of diodes (LED and Zener) – Bridge rectifier using junction diodes – π filter – Transistor – its characteristics (CE mode only) – biasing and action of a single stage transistor (CE) amplifier – frequency response of Hartley oscillator – Modulation (qualitative study) – Op-amp and its characteristics – Virtual earth – Voltage amplifier in inverting mode – Op-amp as adder and subtractor.

UNIT - V:

Binary number system – reason for using binary numbers – binary to decimal and decimal to binary conversions – addition and subtraction of binary numbers – Logic circuits –

Boolean algebra – De Morgan's theorem – OR, AND, NOT, NOR & NAND gates – NOR & NAND gates as universal building blocks – Ex-OR gate.

Book for study

Electricity and Electronics by R.Murugeshan.

Reference Books

1. Solid State Electronics – B.L.Theraja, S. Chand, (2003).
2. Electricity and Magnetism – Brijlal and Subramanyam. S Chand, (2007).

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**

Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **(6-hours)**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**

Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**

Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**

General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

Non Major Elective-I
Chemistry in day-to-day life

Hours per week: 2 **Credits: 2** **Subject Code:** U3CHN51

Course Outcomes :

Students after successful completion of the course will be able to

- Learn about cosmetics
- Know about polymers and their role
- Learn the chemical aspects of Milk and milk products
- Understand the role of chemistry in food science
- Know the details of drugs.

Unit I: Cosmetics **(6 hours)**

Tooth powder, tooth paste, soaps and Detergents - cleansing action - Differences between soaps and detergents- talcum powder, lipstick, nail polish, eyetex, shampoo, hair dye, perfumes-vanishing creams.

Unit II: Polymers in our life **(6 hours)**

Polymers and their classification with examples; Thermo and thermosetting polymers
Commercial polymers: Polyethylene, PVC & Polyesters (Elementary idea only-Definition, examples & uses); Plastic identification code & Recycle
Biomedical applications of polymers: Polymers used in surgery, Polymers used in medicine, contact lens, dental polymers, artificial heart & kidney.

Unit III: Milk and Milk products **(6 hours)**

Composition of milk – flavor and aroma – physical properties – pasteurisation – methods of pasteurisation – effects of pasteurisation. Ice cream – stabilizers – emulsifier. Dry milk – types, properties and uses.

Unit IV: Food Chemistry **(6 hours)**

Food - Nutrients - Classification, sources and functions of Carbohydrate, Proteins, Vitamins and Fat- Adulteration of food - Food preservatives - Qualities of food preservatives , examples, Bad effects – Iodized salt- Colouring agents and Flavouring agents.

Unit V: Chemistry for health **(6 hours)**

Importance of chemistry in pharmacy, Drugs-definition and example for antibiotics, anesthetics, antiseptics, antacids, antipyretics, hypnotics, sedatives, laxatives, dental cement, and antimalarial drugs, cancer-cobalt therapy, AIDS - causes and prevention.

Reference Books

Unit I - II

1. B.K. Sharma, "Industrial Chemistry" Goel publishing House, 1994.

Unit III

1. Fundamental Concepts of Applied Chemistry, Jeyashree Ghosh, S. Chand & Company Ltd., 2008.

Unit IV

1. N.Shakuntala Manay and M.Shadaksharaswamy, "Food, Facts and Principles", New age international publisher, New Delhi, Third edition, 1997.
2. Lillian Hoagoland Meyer, Food Chemistry, CBS Publishers and Distributors, New Delhi 1994.
3. B.Srilakshmi, Food Science, New Age International Publishers, New Delhi, fifth edition 2010.

Unit V

1. A Text book of pharmaceutical Chemistry, Jeyashree Ghosh, 2003,S. Chand and Company Ltd., Ram Nagar, New Delhi

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SEMESTER-VI
ORGANIC CHEMISTRY II

Hours per week: 4 **Credits: 4** **Subject Code: U2CHC61**

Course Outcomes :

Students after successful completion of the course will be able to

- Offer sufficient basic knowledge in elucidating the structure of natural products.
- Inculcate the curiosity in learning conformational analysis.
- Provide basic knowledge in the spectroscopy.
- Create awareness in learning re-arrangement reactions.
- Impart the knowledge of dyes and its application.

Unit-I: Molecular rearrangements (12 hours)

Molecular rearrangements - definition- Intra & Inter molecular rearrangement reactions-methods used to identify the inter and intra molecular rearrangement - Detailed mechanism of the following rearrangements - Carbon to carbon migration (rearrangement to electron deficient carbon) - Pinacol-pinacolone, Benzil- benzilic acid, Carbon to nitrogen migration (rearrangement to electron deficient nitrogen) - Hofmann, Beckmann rearrangement – Aromatic rearrangement - Claisen, Benzidine, Fries rearrangement.

Chemotherapy: Drug - classification of drugs – drug action – sulpha drugs (sulphonamide)-mode of action of sulpha drugs – antibiotics - penicillin and its derivatives – mode of action – chloramphenicol, tetracycline and streptomycin and their uses - antimalarial drugs-antipyretics and analgesics (narcotic and non-narcotics)-tranquillizer-antiseptics and disinfectants.

Unit-II: Spectroscopy of organic molecules (12 hours)

UV Spectroscopy-absorption laws- types of electronic transition- bathochromic, hypsochromic, hyperchromic and hypochromic effects - applications of UV spectroscopy to organic compounds- Woodward- Fieser rule applied to conjugated dienes and α,β-unsaturated ketones.

IR Spectroscopy- Introduction-mode of vibration-selection rule-group frequency concept-application of IR to organic compounds-Finger print region - effect of hydrogen bond.

NMR Spectroscopy: Introduction- chemical shift- shielding and deshielding effects-factors influencing chemical shift value- use of TMS as reference - splitting of signals- coupling constants- ^{1}H NMR spectra of simple organic compounds like bromoethane, ethanol, propanal, benzene and benzaldehyde.

Unit-III: Alicyclic compounds and Conformational analysis (12 hours)

Alicyclic compounds: General methods of preparation and properties of cycloalkanes-Bayer's strain theory and its modification. Synthesis of Civetone and muscone (any one method) - structure only (elucidation not necessary)

Conformational analysis: Difference between configuration and conformation. Fischer, Sawhorse and Newmann projection formula- conformational analysis of ethane, n-butane, 1,2- dichloroethane, cyclohexane and monosubstituted cyclohexane.

Unit-IV: Alkaloids and Terpenes (12 hours)

Alkaloids: General methods of isolation and determination of structure of alkaloids - classification of alkaloids- structural elucidation of the following alkaloids – Coniine, piperine (piperidine alkaloids) and nicotine (pyrrolidine-pyridine alkaloids).

Terpenes: Introduction, classification, occurrence and isolation-general properties- isoprene rule- general methods for determining structure – structural elucidation of citral, geranial (acyclic terpene) and terpineol (monocyclic terpene).

Unit – V: Proteins, nucleic acids and Dyes (12 hours)

Proteins and nucleic acid: definition - classification of proteins - colour reactions of proteins- primary, secondary, tertiary and quaternary structure of proteins (an elementary idea only)- Nucleic acids-Nucleosides and Nucleotides- RNA and DNA - structure and differences.

Dyes: Definition- theories of colour and constitution - classification of dyes according to their structure and application. Azo dyes- preparation of methyl orange & Congo red- triphenyl methane dyes - preparation of malachite green, rosaniline and crystal violet- Phthalein dyes- preparation of phenolphthalein, fluorescein and eosin- Vat dyes- preparation of indigo.

References:

Unit I, III,IV and V:

1. I.L. Finar, Organic Chemistry Vol.I, ELBS, 6th edition, 1973.
2. I.L. Finar, Organic Chemistry Vol.II, ELBS, 6th edition, 1973.
3. R.T. Morrison and R.W.Boyd, Organic Chemistry, Printice Hall of India private Ltd, 6 th edition, 2001.
4. P.L.Soni, Organic Chemistry, Sultan Chand & Sons,New Delhi, 29th edition, 2007.
5. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd, Ram Nagar, New Delhi,14th edition,1996.
6. M.K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, Jalandhar-Delhi, 4th edition, 2013

Unit – II

1. P.S Kalsi, Spectroscopy of organic compounds, New Age International (P) Ltd, 6th edition, 2004.
2. B.M.Silverstein, G.C.Bassler and T.C.Morrill, Spectroscopic Identification of Organic Compounds. John wiley & Sons Inc, 6th edition, 2005.
3. William Kemp, Organic Spectroscopy, Mac Millan Press Ltd, 1st edition, 1975.
4. Y.R. Sharma Elementary Organic spectroscopy, S.Chand & Co, New Delhi, Fourth Edition, 2007

Physical Chemistry II

Hours per week: 4 **Credits: 4** **Subject Code: U3CHC62**

Course Outcomes :

Students after successful completion of the course will be able to

- Solve thermo-chemical equations and to get basic ideas on thermodynamics of open system
- Understand the basic concepts of group theory in Chemistry
- Get basic ideas and applications of molecular spectroscopy such as microwave, IR, Raman, Electronic, NMR and EPR.
- Acquire basic knowledge behind various photophysical and photochemical processes

Unit I: Thermodynamics III (12 hours)

Thermochemistry- Hess's law of constant heat summation – Kirchoff's equation – Bond enthalpies and its applications in the determination of enthalpies of reactions, enthalpies of formation of compounds and resonance energy.

Thermodynamics of open systems- Partial molar quantities – definition and significance of chemical potential –Gibbs-Duhem equation – variation of chemical potential with

temperature and pressure– Clausius-Clapeyron equation – derivation and applications – Concept of fugacity- determination- physical significance-concept of activity- activity coefficient- reference or standard states of gas, liquid and solid.
Nernst heat theorem- formulation of third law of thermodynamics- concept of residual entropy.

Unit II: Group theory (12 hours)

Molecular symmetry elements and symmetry operations – classification of group- definitions, theorems and grammar of group theory- subgroups- product of symmetry operations – classes and similarity transformation –Inverse and cyclic rules for writing group multiplication table - Classification of molecules into point groups – rotational (C & S), Dihedral (D) and T- type (T_d& O_h) point groups with examples. Transformation matrices of symmetry operations.

Unit III: Molecular Spectroscopy I (12 hours)

Introduction – electromagnetic radiation – different regions – absorption spectroscopy – molecular spectra – types of molecular spectra.
Rotational spectra of diatomic molecules – rigid rotator (no derivation) – selection rule – determination of moment of inertia and bond length.
Vibrational spectra – IR spectra of diatomic molecules – Hooke's law – simple harmonic oscillator (no derivation) - force constant – selection rule – vibrational energy level diagram – applications – force constant determination. Modes of vibration in polyatomic molecules – vibrational spectra of H_2O and CO_2- Rotational vibrational spectra of diatomic molecules.

Unit IV: Molecular Spectroscopy II (12 hours)

Raman spectra – Raman effect – Stokes and anti-Stokes lines – quantum theory of Raman effect – experimental study – comparison between IR and Raman spectroscopy – applications of Raman spectra- Electronic Spectroscopy – Franck-Condon principle-Types of electronic transition- Nuclear magnetic resonance spectroscopy – theory of NMR spectroscopy- types of NMR spectroscopy- Position of NMR signals- chemical shift- number and position of NMR signals – ^{1}H NMR spectra of ethanol - Electron paramagnetic resonance spectroscopy – principle – difference between NMR and EPR –EPR spectrum of hydrogen and methyl radicals.

Unit V: Photochemistry (12 hours)

Definition of photochemical reactions – comparative study of thermal and photochemical reactions – laws of photochemistry – Lambert and Beer's law – Grotthus-Draper's law – Stark-Einstein law – quantum efficiency and its determination – reasons for high and low quantum efficiency - consequence of light absorption by atoms and molecules – Jablonski diagram - photophysical processes – fluorescence, phosphorescence and other deactivating processes – Photochemical processes – kinetics of photochemical reactions. Gaseous reactions: Hydrogen-halogen reactions (formation of HCl and HBr and decomposition of HI) - Photosensitization, chemiluminescence – bioluminescence.

Recommended Books

UNIT I

1. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry, (2010) Vishal Publishing Co., Jalandhar.
2. P.L. Soni, Principles of Physical Chemistry, S. Chand & Co., New Delhi, (1980).

3. B.S. Bahl, G.D. Tuli and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co., New Delhi (2000).

UNIT II

1. F.A.Cotton, Chemical Applications of Group Theory, 3rd, Edn., John Wiley & Sons, New York (1999).
2. V.Ramakrishnan and M.S. Gopinath, Group theory in chemistry, 2nd Edn., Vishal Publications (1991).
3. K.V. Raman, Group theory and its application to chemistry, Tata McGraw-Hill Pub. Co., (1990)

UNIT III & IV

1. C.N.Banwell and E.M.McCash, Molecular Spectroscopy, Tata McGraw Hill, 4th Edn., (1995).
2. G. Aruldhas, "Molecular Structure and Spectroscopy", Prentice-Hall of India Pvt., Ltd., New Delhi (2001)

UNIT V

1. K.K. Rohatgi Mukherjee, Fundamentals of Photochemistry,New age international private limited, (2000).
2. N.J. Turro, Modern Molecular Photochemistry, Benjamin Cummings (1965)

Part III Core subject X – Inorganic Chemistry - II

Hours per week: 4 **Credits: 4** **Subject Code: U3CHC63**

Course Outcomes:

Students after successful completion of the course will be able to

- Know the basics of thermo analytical methods.
- Understand the basics of metal carbonyls and f-block elements.
- Acquire fundamental knowledge on Chromatographic techniques
- Learn the basics of Bio-inorganic Chemistry

Unit I: Bio-inorganic chemistry (12 hours)

Porphyrin ring system – metalloporphyrin - Iron porphyrins - structure and functions of hemoglobin and myoglobin - Bohr effect - explanation for cooperativity effect. Structure and functions of chlorophyll – ionophores - sodium-potassium ion pump. Metal ion toxicity and chelate therapy.

Unit II: Chromatography (12 hours)

Definition – Types of chromatography – Theories of chromatography – retardation factor – retention volume – Column capacity. Thin layer chromatography: choice of adsorbent and solvent preparation - R_f value. Ion exchange chromatography: principle – resins - action of resins, experiment techniques, applications**.** High performance chromatography (HPLC) : Principle - Instrumentation – apparatus and materials – applications. Gas chromatography: principle of gas chromatography – Gas-liquid chromatography – instrumentation – applications.

Unit III: Metal Carbonyls (12 hours)

π - Acid complexes - low oxidation state of metal in metal carbonyls. Classifications of metal carbonyls - EAN rule applied to metal carbonyls. Bonding of metal carbonyls – Identification

of metal carbonyls by IR spectroscopy. General methods of preparation and properties. Structure of $Cr(CO)_6$, $Ni(CO)_4$, $Fe(CO)_5$, $V(CO)_6$, $Mn_2(CO)_{10}$, $Fe_2(CO)_9$, $Co_2(CO)_8$ and $Fe_3(CO)_{12}$.

Unit IV: f-Block elements (12 hours)

Lanthanide series - electronic configuration - oxidation states - atomic and ionic radii of M^{3+} ions - Lanthanide contraction - colour of M^{3+} cations - occurrence, extraction of lanthanides from monazite sand.

Actinide series –occurrence - electronic configuration - oxidation states - atomic and ionic radii of M^{3+} ions - Actinide contraction - colour of M^{3+} cations. Comparison between lanthanides and actinides. Trans-uranic elements.

Unit V: Gravimetric and Thermo analytical methods (12 hours)

Gravimetric analysis: Principle – mechanism of precipitation – factors affecting solubility of precipitates - Coprecipitation - Post precipitation. Digestion, Washing and Drying/Ignition of the precipitate.

Thermo analytical method – Principle of thermogravimetry, differential thermal analysis-Instrumentation for TGA and DTA – factors affecting TGA and DTA curves – TGA and DTA of calcium oxalate monohydrate and copper sulphate pentahydrate.

Reference Books

Unit-I

1.B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
2.Bertini, H.B.Gray, S.J. Lippard and J.S. Valantine, Bioinorganic Chemistry, Viva Books Private Limited., 1998.
3.R.Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Private Limited, New Delhi, 2010.

Unit-II

1. B.K. Sharma, Instrumental methods of Chemical Analysis, Goel Publishing House 23rd Edition, 2004.
2.V.K. Srivastava, and K.K. Srivastava, Introduction to Chromatography- Theory and Practice, S. Chand & Co., 1987.
3. Gurdeep R.Chatwal and Sham K.Anand, Instrumental methods of chemical analysis, Himalaya publishing house, 2013.

UNIT-III

1. Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2. Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand & Co., New Delhi, Revised reprint 2013.
3. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
4. R. Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Private Limited, New Delhi, 2010.

UNIT-IV

1.Sathya Prakash's Modern Inorganic Chemistry, R.D.Madan, S.Chand & Co., New Delhi, 2005.
2.Advanced Inorganic Chemistry, Sathya Prakash, Volume I and II, S.Chand &

Co., New Delhi, Revised reprint 2013.
3.B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
4.P. L. Soni and M. Katyal, Textbook of Inorganic Chemsitry, Sultan Chand and Sons, New Delhi.

UNIT-V

1.Vogel's Text Book of Quantitative Chemical Analysis, V Edition, ELBS, 1989.
2.B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
3.B.K. Sharma, Instrumental methods of Chemical Analysis, Goel Publishing House 23rd Edition, 2004.

Part III – Core III – LAB: Organic preparation and Gravimetric Estimation

Hours per week: 3 Credits: 4 Subject Code: U1CHC6P1

Course Outcomes :

- To study the basics of organic preparation.
- To acquire knowledge on gravimetric estimation.

Organic preparation:

1. Oxidation : Preparation of benzoic acid from benzaldehyde
2. Hydrolysis: (i) Preparation of benzoic acid from benzamide
(ii) Preparation of benzoic acid from ethyl benzoate.
3. Acetylation: Preparation of acetanilide from aniline
4. Bromination: Preparation of p-bromoacetanilide from acetanilide
5. Nitration: (i) Preparation of m-dinitrobenzene from nitrobenzene
(ii) Preparation of picric acid from phenol.
6. Benzoylation: Preparation of β-naphthyl benzoate from β-naphthol
7. Addition: Preparation of osazone from glucose.

Gravimetric Estimation:

1. Estimation of lead as lead chromate.
2. Estimation of barium as barium chromate.
3. Estimation of calcium as calcium oxalate
4. Estimation of copper as cuprous thiocyanate.
5. Estimation of nickel as Ni-Dimethylglyoxime.

Part III – Core IV – LAB: Organic Analysis and Organic Estimation

Hours per week: 3 Credits: 4 Subject Code: U1CHC6P2

Course Outcomes :

1. To acquire knowledge about the analysis of simple organic compounds.
2. To know the fundamental strategies of organic estimation.

Organic Analysis

Analysis of organic compound containing one or two functional groups and confirmation by preparing of a solid derivative – acids, phenols, aldehydes, ketones, esters, nitro compounds, amines, amides, anilides, aliphatic diamide, and sulphur analogue of diamide, carbohydrate.

Organic Estimation

1. Estimation of phenol

2. Estimation of aniline

Part III Core V - LAB – Physical Chemistry experiments

Subject Code: U2CHC6P3

Objective:

The theoretical concepts dealt in the physical chemistry theory papers are given as experiments for the better understanding of the concepts.

I. **Determination of molecular weight by**

1. Transition temperature method – Sodium thiosulphate pentahydrate, sodium acetate trihydrate
2. Cryoscopic method –Rast method

II **Phase diagram**

1. Simple eutectic phase diagram

III **Critical Solution Temperature**

1. Determination of CST of phenol – water system
2. Effect of impurity on CST of phenol water system

IV **Heat of Solution**

1. Determination of heat of solution of oxalic acid in water
2. Determination of heat of solution of $K_2Cr_2O_7$ in water
3. Determination of heat of solution of $(NH_4)_2C_2O_4$ in water

V **Kinetic experiments**

1. Kinetics of acid catalysed hydrolysis of ester

a) Determination of rate constant of the reaction

b) Determination of relative strength of acids.

VI **Conductometric methods**

1. Acid base titration: $NH_4Cl \rightarrow NaOH \rightarrow HCl$
2. Determination of cell constant of the given cell and determination of dissociation constant of weak acid.

VII **Potentiometric methods**

1. Acid base titration: HCl vs NaOH
2. Redox titration: $KMnO_4$ vs FAS

COURSE : ALLIED PHYSICS SEMESTER : IV	**OPTICS, SPECTROSCOPY AND MODERN PHYSICS**	Hours : 4 Credit : 4

Subject Code: U1PHA6X4

UNIT - I:

Deviation produced by thin lens – Focal length of two thin lenses in and out of contact – Cardinal points – Refraction through a thin prism – Dispersion – Dispersive power – Combination of thin prisms to produce (a) deviation without dispersion and (b) dispersion without deviation – Direct vision spectroscope – Chromatic aberrationin lenses and its

removal – Spherical aberration in lenses and its removal – Aplanatic lenses – Oil immersion objective – Theory of primary and secondary rainbows.

UNIT - II:

Interference in thin films – Airwedge – Newton's rings (Refected beam only) – Determination of wavelength – Jamin's interferometer – Principle and use.

Diffraction – Theory of plane transmission grating (Normal incidence only) – Experiment to determine wavelength.

UNIT - III:

Double refraction – Nicol prism, constructions, action and uses – QWP and HWP – Optic activity (no theory) – Biot's laws – Specific rotatory power – Half shade polarimeter – Determination of specific rotatory power – Fibre optics – Light propagation in fibres – Fibre optic communication systems.

UNIT - IV:

Infrared radiation – production, properties and uses – Ultraviolet radiation sources, properties and uses – Quantum theory – Planck's quantum thory – Raman effect – simple theory experimental study (Wood's apparatus) – Applications – Photoelectricity – Laws of photoelectricity – Einstein equations – Photo cells and their uses – Photo emissive, photo conductive and photo voltaic cells.

UNIT - V:

De Broglie's theory - electron diffraction – G.P.Thomson experiment – Michelson Morley experiment – Significance of negative results – Postulates of special theory of relativity – Lorentz transformation equations (no derivation) – Length contaction – Time dilation – Variation of mass with velocity – Mass-energy relation(simple derivation).

Book for study

Optics, Spectroscopy and Modern Physics by R.Murugeshan.

Reference Books

1. A Text Book of Optics by Brijlal and N.Subramanyam S.Chand, (2002).

COURSE : ALLIED PHYSICS	**ALLIED: PHYSICS PRACTICAL –II**	Hours : 2 Credit : 2

Subject Code: U2PHA6PX

INTERNAL: 40 **EXTERNAL: 60**

1. Spectrometer – Grating (Normal incidence).
2. Spectrometer – Dispersive power of the prism.
3. Newton's rings.
4. Air wedge – Thickness of insulation.
5. Series resonance.
6. Parallel resonance.
7. Comparison of Capacitance – Desauty's Bridge (AC method)
8. Logic gates – AND, OR, NOT using discrete components.
9. Logic gates – NAND, NOR using discrete components.
10. Bridge rectifier.
11. Zener diode – Characteristics.
12. Transistor – Static characteristics (CE mode).
13. Hartley oscillator.
14. Verification of De Morgan's laws.

PROJECT

Hours/week-2 **Sub code: U1CH6PR** **Credit: 2**

Course Outcomes :

• To train the students in various research/industry learning skills like critical thinking, creativity, synthesis of knowledge, analyzing capacity, instrument basics and handling and scientific report writing.

• To introduce the frontier areas of research in chemistry and in the interdisciplinary areas among students

• To understand the scope of research programme in chemistry and in the interdisciplinary areas.

• The project work (includes literature review/chemical factory industry visit training /National/University Research Labs visit training / Nuclear Plant/Quality control lab/R&D Lab/field work / theoretical / lab work) is to inculcate students to learn adequate knowledge on research methodology in the subject and prepare them for pursuing research in theoretical / experimental areas of the subject.

Project will be carried out by the final year students in the sixth semester under the guidance of respective guides. The Project work or Field Study is to be undertaken under the guidance of a Teacher of the Department. Projects will be carried out in groups (with maximum of 5 students per group). For projects internal marks (max 50) will be awarded by the respective guide and external marks (max 50) will be awarded by the external examiner during summative practical examination.

INDUSTRIAL CHEMISTRY (UG-NME)

Hours per week: 2 **Credits: 2** **Subject Code: U2CHN61**

Objectives:

- To study the development of chemical industries.
- To learn the toxic effects of metals.
- To know the importance of fuels.

UNIT I: Water Treatment **(6 hours)**

Introduction – Impurities in water – Disadvantages of Hard water – hardness – Estimation of Hardness – EDTA method – Potable water (water for domestic supply) – desalination – electrodialysis – reverse osmosis.

UNIT II: Chemical Toxicology **(6 hours)**

Introduction – Toxic chemicals in the environment. Influence of toxic substances in the body - classification of toxic effects. Toxic effects of various chemicals.

UNIT III: Explosives and Rocket Fuels **(6hours)**

Introduction – Requirements and characteristics of good explosives – Assessment of explosives – Classification of rocket fuels – Propellants and rocket fuels.

UNIT IV: Corrosion protection **(6 hours)**

Introduction – preparation of materials for coating – Metallic coatings - hot dipping – spraying – electroplating – Inorganic non-metallic coatings – surface conversion – anodized oxide coating – porcelain enamel coating.

UNIT V: Fuels **(6 hours)**

Definition and classification of fuels – Characteristics of a good fuel – advantages and disadvantages of solid, liquid and gaseous fuels – Calorific value – bomb calorimeter – calculation of calorific value -coal – Liquid fuels – Gaseous fuels.

Reference book

1. Applied chemistry, N. Krishnamurthy, K. Jeyasubramanian and P. Vallinayagam, Tata Mcgraw-Hill Publishing Company Limited, New Delhi, 1999.

Course Name : Bachelor of Science
Discipline : Chemistry

Self Learning Course

Self-Learning Course (UG Only):

Year	Semester	SELF LEARNING COURSE Subject	Credit	Ext= TOT	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
III	V	COSMETICS	5	100=100	U1CHSL51	Entrepreneurship	No Change
III	V	CHEMISTRY COMPETITIVE SKILL DEVELOPMENT COURSE	5	100=100	U1CHSL52	Skill Development	New

Self-Learning Course (PG Only):

Year	Semester	SELF LEARNING COURSE Subject	Credit	Ext= TOT	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
II	III	APPLIED CHEMISTRY	5	100 =100	P1CHSL31		No Change
II	III	CRITICAL ANALYSIS OF GATE/CSIR-NET QUESTIONS	5	100=100	P1CHSL32	Skill Development & Employability	New

SELF LEARNING

COSMETICS

Credit: 5 **CODE: U1CHSL51**
Total Marks: 100

Unit-I Fundamentals of Cosmetics

Introduction - Classification of cosmetics - Lotions – Creams – Lipsticks – Eye make up – Eye shadow – Eye pencils – Eye Liners – Mascara – Eye make up removers – Antiperspirants – shaving foams – Shampoo and their formulation – dipialtory

Unit-II Hair Preparations

Hair lotions and tonics – Hair conditioners – Hair dressings – Hair creams – Hair sprays – Hair bleaching – Hair dyes – Hair waving preparation – Hair straightness

Unit-III Herbal Cosmetics

Introduction – Aloe vera – Cucumber – turmeric – Khus – Henan – Neam – Amla – Reetha – Voaltile Oils

Unit-IV Skin Preparations

Skin creams – Anti wrinkle creams - Skin protective creams - Cleansing creams – moisturizing and foundation creams- cold creams – Night and massage creams –Hand creams and lotions.

Unit-V Face Preparations

Introduction - formulation of face powder – compact face powder – talcum powder – Baby powders – face masks and packs – Evaluation and quality control –Commercially available brands.

Reference:

"Text Book of Cosmetics" by Garud-Sharma-Garud, Pragati Prakashan, 2012.

CHEMISTRY COMPETITIVE SKILL DEVELOPMENT COURSE

Credit: 5 **CODE: U1CHSL52**

Total Marks: 100

Course Outcomes:

Students, after successful completion of the course ,will be able to

- Understand the fundamentals of chemistry concepts
- Apply and solve the chemistry problems
- Prepare for the competitive exam
- Pass the competitive exam successfully

Unit I:

- **Theory of Gases:** Equation of state for ideal and non-ideal (van der Waals) gases; Kinetic theory of gases; Maxwell-Boltzmann distribution law; equipartition of energy.
- **Chemical Thermodynamics:** Reversible and irreversible processes; first law and its application to ideal and nonideal gases; thermochemistry; second law; entropy and free energy; criteria for spontaneity.
- **Chemical and Phase Equilibria:** Law of mass action; K_p, K_c, K_x and K_n; effect of temperature on K; ionic equilibria in solutions; pH and buffer solutions; hydrolysis; solubility product; phase equilibria–phase rule and its application to one-component and two-component systems; colligative properties.
- **Electrochemistry:** Conductance and its applications; transport number; galvanic cells; EMF and free energy; concentration cells with and without transport; polarography; concentration cells with and without transport; Debey-Huckel-Onsagar theory of strong electrolytes.
- **Chemical Kinetics:** Reactions of various order; Arrhenius equation; collision theory; transition state theory; chain reactions – normal and branched; enzyme kinetics; photochemical processes; catalysis.
- **Adsorption:** Gibbs adsorption equation; adsorption isotherm; types of adsorption; surface area of adsorbents; surface films on liquids.

Unit II:

- **Basic Concepts in Organic Chemistry and Stereochemistry:** Electronic effects (resonance, inductive, hyperconjugation) and steric effects and its applications (acid/base property); optical isomerism in compounds with and without any stereocenters (allenes, biphenyls); conformation of acyclic systems (substituted

ethane/n-propane/n-butane) and cyclic systems (mono- and di-substituted cyclohexanes).

- **Organic Reaction Mechanism and Synthetic Applications:** Chemistry of reactive intermediates (carbocations, carbanions, free radicals, carbenes, nitrenes, benzynes etc.); Hofmann-Curtius-Lossen rearrangement, Wolff rearrangement, Simmons-Smith reaction, Reimer-Tiemann reaction, Michael reaction, Darzens reaction, Wittig reaction and McMurry reaction; Pinacol-pinacolone, Favorskii, benzilic acid rearrangement, dienone-phenol rearrangement, Baeyer-Villeger reaction; oxidation and reduction reactions in organic chemistry; organometallic reagents in organic synthesis (Grignard, organolithium and organocopper); Diels-Alder, electrocyclic and sigmatropic reactions; functional group inter-conversions and structural problems using chemical reactions.
- **Natural Products Chemistry:** Chemistry of alkaloids, steroids, terpenes, carbohydrates, amino acids, peptides and nucleic acids.
- **Aromatic and Heterocyclic Chemistry:** Monocyclic, bicyclic and tricyclic aromatic hydrocarbons, and monocyclic compounds with one hetero atom: synthesis, reactivity and properties.

Unit III:

- **Periodic Table:** Periodic classification of elements and periodicity in properties; general methods of isolation and purification of elements.
- **Main Group Elements (s and p blocks):** General concepts on group relationships and gradation in properties; structure of electron deficient compounds involving main group elements.
- **Transition Metals (d block):** Characteristics of 3d elements; oxide, hydroxide and salts of first row metals; coordination complexes: structure, isomerism, reaction mechanism and electronic spectra; VB, MO and Crystal Field theoretical approaches for structure, color and magnetic properties of metal complexes; organometallic compounds having ligands with back bonding capabilities such as metal carbonyls, carbenes, nitrosyls and metallocenes; homogenous catalysis.
- **Bioinorganic Chemistry:** Essentials and trace elements of life; basic reactions in the biological systems and the role of metal ions, especially Fe^{2+}, Fe^{3+}, Cu^{2+} and Zn^{2+}; structure and function of hemoglobin and myoglobin and carbonic anhydrase.

Unit IV:

- **Basic Mathematical Concepts:** Functions; maxima and minima; integrals; ordinary differential equations; vectors and matrices; determinants; elementary statistics and probability theory.
- **Atomic and Molecular Structure:** Fundamental particles; Bohr's theory of hydrogen-like atom; wave-particle duality; uncertainty principle; Schrödinger's wave equation; quantum numbers; shapes of orbitals; Hund's rule and Pauli's exclusion principle; electronic configuration of simple homonuclear diatomic molecules.
- **Chemical Bonding and Shapes of Compounds:** Types of bonding; VSEPR theory and shapes of molecules; hybridization; dipole moment; ionic solids; structure of NaCl, CsCl, diamond and graphite; lattice energy.
- **Solid State:** Crystals and crystal systems; X-rays; NaCl and KCl structures; close packing; atomic and ionic radii; radius ratio rules; lattice energy; Born-Haber cycle; isomorphism; heat capacity of solids.

Unit V:

- **Spectroscopy:** Beer-Lambert law; fundamental concepts of rotational, vibrational, electronic and magnetic resonance spectroscopy.
- **Qualitative Organic Analysis:** Identification of functional groups by chemical tests; elementary UV, IR and 1H NMR spectroscopic techniques as tools for structural elucidation.
- **Instrumental Methods of Analysis:** Basic principles; instrumentations and simple applications of conductometry, potentiometry and UV-vis spectrophotometry; analysis of water, air and soil samples.
- **Analytical Chemistry:** Principles of qualitative and quantitative analysis; acid-base, oxidation-reduction and complexometric titrations using EDTA; precipitation reactions; use of indicators; use of organic reagents in inorganic analysis; radioactivity; nuclear reactions; applications of isotopes.

SELF LEARNING (PG Only)

APPLIED CHEMISTRY

Credit: 5 **Subject Code: P1CHSL31**

Total marks 100

Unit I FUELS

Classification of fuels – Calorific value- characteristics of a good fuel- Comparison between solid, liquid and gaseous fuels - Coal –chemical constitution and types – Petroleum - classification and composition- Petrol- Kerosene-Diesel- Comparative account of diesel and petrol – Cracking - Knocking - Octane rating - Diesel- index- Natural gas - Coal gas - Oil gas – Producer gas - Water gas- Biogas.

Reference:

1. P. C. Jain & M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, 2000.
2. B. K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, India, 1994.

Unit II MATCH INDUSTRY

Advantages of Safety matches over Lucifer matches – Preparation, properties and uses of chemicals in matchstick head**:** $KClO_3$, KNO_3, Sulphur, Antimony sulphide, Borax, MnO_2, Wax, Glue and Potassium dichromate.

Body composition of colour and/or star matches: Colour matches: $KClO_3$, Barium nitrate, Strontium nitrate, Shellac, Lamp black, Paris green, Resin, Denatured sprit. Manufacturing process of matchsticks – Dipping process: Wax dipping and chemical dipping , drying - automation process.

Manufacture of conventional fireworks products: Flower pot, Ground chackra, Sparkles, Pencil, Crackers, Rockets and Atom bomb, Aerial Shots – Fuse making – Caps and ring caps – gun powder, serpent egg.

Reference:

1. P. L. Sony, "Text Book of Inorganic Chemistry" Mohan Katya Sultan Chand and Sons – New Delhi, 2013.
2. K. N. Ghosh, "The principles of fire works" 1987, Sivakasi.

UNIT-III VEGETABLE OIL INDUSTRY

Cleaning , Dehulling, Heat treatment of oil seeds, Rendering & Cooking types of rendering – Solvent extraction method of oil extraction – Various solvents used for solvent extraction - Modern extraction of gingelly oil from sesame seed.

Refining – effect of refining – types of refining – adsorption method- bleaching – chemical methods of bleaching – deodourisation.

Determination Acid Value (% FFA) – Iodine Value – Bellier Turbidity Temperature for gingelly and groundnut oils.

Reference:

1. C. Paquot, Standard methods for the analysis of Oils, Fats and Derivatives, 6th edition, Pergmon press, 1979.
2. E. A. Weiss, Oilseed Crops, Longman Group Limited, London, 1983.
3. F. D. Gunstone, An Introduction to the chemistry and Biochemistry of Fatty acids and their Glycerides, Chapman and Hall Ltd, 1967.
4. S.BP Board of Consultants and Engineers, Fatty Acids and Products, Small Business Publications, 1970.

UNIT-IV PAINTS AND PIGMENTS

Paints and pigments - formulation, composition and related properties. Oil paint, vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrode and electrolytic), metal spraying and anodizing.

Reference:

1. B. K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, India, 1994.
2. P. C. Jain & M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, 2000.

UNIT V PLASTIC RECYCLING

Introduction to plastic wastes - Sources of plastic wastes - Generation of industrial plastic wastes- Plastics in solid wastes- Future of waste disposal - Primary recycling - Degradation of thermoplastics (Industrial practices) - Secondary Recycling - Approaches to secondary recycling - Chemical modification of mixed plastic waste - Secondary recycling by Co-extrusion & Injection molding - Use of waste plastics as Filler - Tertiary Recycling - Chemicals from waste - Pyrolysis - Chemical decomposition - Quaternary Recycling - Energy from plastic waste - Recycling of Various Plastics: HDPE, Acrylics, PET, PVC, Medical Plastics - Resin Identification Number (RIN) and its significance in recycling of plastics.

Reference:

1. Plastic Wastes in the Environment, Institute of European environmental Policy, 2011.
2. Good Practices Guide on Waste Plastic Recycling, by Local and Regional Authorities.

CRITICAL ANALYSIS OF GATE/CSIR-NET QUESTIONS

Credit: 5 **CODE: P1CHSL32**
Total Marks: 100

Course Outcomes:
Students, after successful completion of the course, will be able to

- Understand the fundamentals of chemistry concepts
- Apply and solve the chemistry problems
- Prepare for the competitive exam
- Pass the competitive exam successfully

Unit-I :

- **Equilibrium:** Laws of thermodynamics. Standard states. Thermochemistry. Thermodynamic functions and their relationships: Gibbs-Helmholtz and Maxwell relations, van't Hoff equation. Criteria of spontaneity and equilibrium. Absolute entropy. Partial molar quantities. Thermodynamics of mixing. Chemical potential. Fugacity, activity and activity coefficients. Chemical equilibria. Dependence of equilibrium constant on temperature and pressure. Non-ideal solutions. Ionic mobility and conductivity. Debye-Hückel limiting law. Debye-Hückel-Onsager equation. Standard electrode potentials and electrochemical cells. Potentiometric and conductometric titrations. Phase rule. Clausius-Clapeyron equation. Phase diagram of one component systems: CO_2, H_2O, S; two component systems: liquid-vapour, liquid-liquid and solid-liquid systems. Fractional distillation. Azeotropes and eutectics. Statistical thermodynamics: microcanonical and canonical ensembles, Boltzmann distribution, partition functions and thermodynamic properties.
- **Kinetics:** Transition state theory: Eyring equation, thermodynamic aspects. Potential energy surfaces and classical trajectories. Elementary, parallel, opposing and consecutive reactions. Steady state approximation. Mechanisms of complex reactions. Unimolecular reactions. Kinetics of polymerization and enzyme catalysis. Fast reaction kinetics: relaxation and flow methods. Kinetics of photochemical and photophysical processes.
- **Surfaces and Interfaces:** Physisorption and chemisorption. Langmuir, Freundlich and BET isotherms. Surface catalysis: Langmuir-Hinshelwood mechanism. Surface tension, viscosity. Self-assembly. Physical chemistry of colloids, micelles and macromolecules.

Unit-II :

- **Main Group Elements:** Hydrides, halides, oxides, oxoacids, nitrides, sulfides – shapes and reactivity. Structure and bonding of boranes, carboranes, silicones, silicates, boron nitride, borazines and phosphazenes. Allotropes of carbon. Chemistry of noble gases, pseudohalogens, and interhalogen compounds. Acid-base concepts.
- **Transition Elements:** Coordination chemistry – structure and isomerism, theories of bonding (VBT, CFT, and MOT). Energy level diagrams in various crystal fields, CFSE, applications of CFT, Jahn-Teller distortion. Electronic spectra of transition metal complexes: spectroscopic term symbols, selection rules, Orgel diagrams, charge-transfer spectra. Magnetic properties of transition metal complexes. Reaction mechanisms: kinetic and thermodynamic stability, substitution and redox reactions.

- **Lanthanides and Actinides:** Recovery. Periodic properties, spectra and magnetic properties.
- **Organometallics:** 18-Electron rule; metal-alkyl, metal-carbonyl, metal-olefin and metal-carbene complexes and metallocenes. Fluxionality in organometallic complexes. Types of organometallic reactions. Homogeneous catalysis - Hydrogenation, hydroformylation, acetic acid synthesis, metathesis and olefin oxidation. Heterogeneous catalysis - Fischer-Tropsch reaction, Ziegler-Natta polymerization.

Unit-III:

- **Reaction Mechanisms:** Basic mechanistic concepts – kinetic *versus* thermodynamic control, Hammond's postulate and Curtin-Hammett principle. Methods of determining reaction mechanisms through identification of products, intermediates and isotopic labeling. Nucleophilic and electrophilic substitution reactions (both aromatic and aliphatic). Addition reactions to carbon-carbon and carbon-heteroatom (N,O) multiple bonds. Elimination reactions. Reactive intermediates – carbocations, carbanions, carbenes, nitrenes, arynes and free radicals. Molecular rearrangements involving electron deficient atoms.
- **Organic Synthesis:** Synthesis, reactions, mechanisms and selectivity involving the following classes of compounds – alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids, esters, nitriles, halides, nitro compounds, amines and amides. Uses of Mg, Li, Cu, B, Zn and Si based reagents in organic synthesis. Carbon-carbon bond formation through coupling reactions - Heck, Suzuki, Stille and Sonogoshira. Concepts of multistep synthesis - retrosynthetic analysis, strategic disconnections, synthons and synthetic equivalents. Umpolung reactivity – formyl and acyl anion equivalents. Selectivity in organic synthesis – chemo-, regio- and stereoselectivity. Protection and deprotection of functional groups. Concepts of asymmetric synthesis – resolution (including enzymatic), desymmetrization and use of chiral auxilliaries. Carbon-carbon bond forming reactions through enolates (including boron enolates), enamines and silylenol ethers. Michael addition reaction. Stereoselective addition to C=O groups (Cram and Felkin-Anh models).
- **Pericyclic Reactions and Photochemistry:** Electrocyclic, cycloaddition and sigmatropic reactions. Orbital correlations - FMO and PMO treatments. Photochemistry of alkenes, arenes and carbonyl compounds. Photooxidation and photoreduction. Di-π-methane rearrangement, Barton reaction.
- **Heterocyclic Compounds**: Structure, preparation, properties and reactions of furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline.

Unit-IV:

- **Structure:** Postulates of quantum mechanics. Time dependent and time independent Schrödinger equations. Born interpretation. Particle in a box. Harmonic oscillator. Rigid rotor. Hydrogen atom: atomic orbitals. Multi-electron atoms: orbital approximation. Variation and first order perturbation techniques. Chemical bonding: Valence bond theory and LCAO-MO theory. Hybrid orbitals. Applications of LCAO-MOT to H^{2+}, H_2 and other homonuclear diatomic molecules, heteronuclear diatomic molecules like HF, CO, NO, and to simple delocalized π– electron systems. Hückel approximation and its application to annular π – electron systems. Symmetry elements and operations. Point groups and character tables. Origin of selection rules for rotational, vibrational, electronic and Raman spectroscopy of diatomic and polyatomic molecules. Einstein coefficients. Relationship of transition moment

integral with molar extinction coefficient and oscillator strength. Basic principles of nuclear magnetic resonance: nuclear *g* factor, chemical shift, nuclear coupling.

- **Radioactivity:** Decay processes, half-life of radioactive elements, fission and fusion processes.
- **Bioinorganic Chemistry:** Ion (Na^+ and K^+) transport, oxygen binding, transport and utilization, electron transfer reactions, nitrogen fixation, metalloenzymes containing magnesium, molybdenum, iron, cobalt, copper and zinc.
- **Solids:** Crystal systems and lattices, Miller planes, crystal packing, crystal defects, Bragg's law, ionic crystals, structures of AX, AX_2, ABX_3 type compounds, spinels, band theory, metals and semiconductors.

Unit-V:

- **Stereochemistry**: Chirality of organic molecules with or without chiral centres and determination of their absolute configurations. Relative stereochemistry in compounds having more than one stereogenic centre. Homotopic, enantiotopic and diastereotopic atoms, groups and faces. Stereoselective and stereospecific synthesis. Conformational analysis of acyclic and cyclic compounds. Geometrical isomerism. Configurational and conformational effects, and neighbouring group participation on reactivity and selectivity/specificity.
- **Biomolecules**: Structure, properties and reactions of mono- and di-saccharides, physicochemical properties of amino acids, chemical synthesis of peptides, structural features of proteins, nucleic acids, steroids, terpenoids, carotenoids, and alkaloids.
- **Instrumental Methods of Analysis:** UV-visible spectrophotometry, NMR and ESR spectroscopy, mass spectrometry. Chromatography including GC and HPLC. Electroanalytical methods- polarography, cyclic voltammetry, ion-selective electrodes. Thermoanalytical methods.
- **Spectroscopy**: Applications of UV-visible, IR, NMR and Mass spectrometry in the structural determination of organic molecules.

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Course Name : Bachelor of Science
Discipline : Chemistry

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Allied	GENERAL CHEMISTRY - III	4	4	25+75= 100	U2CHA3X3/ U2CHA5X3	Skill Development	No Change
	Allied	GENERAL CHEMISTRY – IV	4	4	25+75= 100	U3CHA4X4/ U3CHA6X4	Skill Development	20% Revised

ALLIED SUBJECT FOR PHYSICAL SCIENCE

GENERAL CHEMISTRY - III

Hours per week: 4 Credits: 4 **Subject Code: U2CHA3X3/U2CHA5X3**

Course Outcomes:

Students after Successful completion of the course will be able to

- Know the basic requirements of chemical calculations.
- Acquire fundamental knowledge in bonding.
- Gain fundamental knowledge about adsorption, catalysis and co-ordination compounds.
- Learn the principles of water analysis.

Unit I – Basic chemical calculation (12 hours)

Significant numbers – SI Units – Dimensions – Calculation of formula weight – understanding Avogadro number – Mole concept – Mole fraction of the solvent and solute – conversion of grams into moles and moles into grams – Stoichiometric equations. Methods of expressing concentration of the solution – Normality, molarity, molality and mole fraction – Calculations on principle of volumetric analysis.

Unit II – Theories of bonding (12 hours)

Types of the chemical bonds: Ionic bond, covalent bond and coordinate bond – Valence bond theory – Valence Shell Electron Pair Repulsion theory – Shapes of CH_4, H_2O and NH_3 molecules – Molecular orbital theory – Bonding and antibonding orbital – MO theory applied to homonuclear molecules – H_2, $N_2$and O_2– comparative study of VB and MO theories.

Unit III – Coordination compounds (12 hours)

Introduction – nomenclature – Werner's theory – Coordination number and geometry – EAN rule – Valence Bond theory and Bonding in octahedral and tetrahedral complexes – Low spin and high spin complexes – Crystal field theory (octahedral and tetrahedral splitting only) .

Unit IV – Adsorption and catalysis (12 hours)

Adsorption:

Definition of various terms (adsorption, absorption, adsorbent, adsorbate, sorption & desorption) – Difference between adsorption and absorption – Factors affecting the adsorption of gases on solids – Physical and chemical adsorption – Adsorption isotherms (Langmuir & Freundlich basic ideas only) – Applications of adsorption.

Catalysis:

Definition – Characteristics of catalysis – Promoters and poisons – Enzyme catalysis – characteristics of enzyme catalysis (Michaelis-Menton equation only) – Acid-base catalysis and autocatalysis – Applications of catalysis.

Unit V – Water treatment **(12 hours)**

Water quality analysis – Chemical and physical analysis of water quality parameters - Standards prescribed for water quality by WHO and Indian standards – Sea water as a source of drinking water.

Sewage treatment

Sewage –Objectives of sewage treatment – General purification reaction: aerobic and anaerobic process – Methods of sewage disposal (Bio chemical oxidation, chemical precipitation and chlorination process) – Sludge disposal (septic tank treatment and sludge digestion).

Reference Books

Unit-I

1. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-II

1. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
2. R. Gopalan Textbook of Inorganic Chemistry, Universities Press Pvt. Ltd., 2012.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
4. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.

Unit-III

1. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
2. R. Gopalan Textbook of Inorganic Chemistry, Universities Press Pvt. Ltd., 2012.
3. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
4. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.

Unit-IV

1. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand & Co., 2004.
2. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-V

1. A.K.De, Environmental Chemistry (seventh edition), New Age International Publishers NewDelhi, 2010.
2. M.M.Uppal, A Text book of Engineering Chemistry, Khanna Publishers, NewDelhi1988.

GENERAL CHEMISTRY - IV

Hours per week: 4 **Credits: 4** **Subject Code: U3CHA4X4/U3CHA6X4**

Course Outcomes:

Students after Successful completion of the course will be able to

- Know the basics of chemical kinetics.
- Acquire basic idea about drugs.
- Gain knowledge about the chromatographic techniques.
- Understand the role of bio-organic materials.

Unit I – Chemical Kinetics **(12 hours)**

Introduction – rate of reaction – rate law - rate constant - rate equation – order and molecularity of a reaction. Derivation of first order rate constant – Definition and Examples of Pseudounimolecular reactions (Inversion of cane sugar and hydrolysis of ester by acid). Second, third and zero order reactions – examples – half life period (no derivation required).

Unit-II- Drugs **(12 hours)**

Chemotherapy –Anaesthetics – General anaesthetics and local anasethetics (definition and example only). Sulpha drugs (Sulphonamides) - Synthesis and applications of sulpha drugs (sulphanilamide, sulphapyridine, sulphathiazole and sulphadiazine) – Mode of action of sulpha drugs. Antibiotics: Penicillin –Streptomycin- Chloramphenicol (chloromycetin) – Structure and mode of action of these drugs (synthesis not required).

Unit III – Chromatography **(12 hours)**

Basic principles of common types of chromatography – Paper chromatography – Thin layer chromatography – Column chromatography – Ion exchange chromatography. Applications of each techniques.

Unit IV – Proteins, Nucleic acids, Hormones and Vitamins **(12 hours)**

Definition – Classification of proteins – Colour reaction of proteins – Nucleic acids – nucleoside – nucleotides and general structure of DNA. Hormones – Classification – structure of some sex hormones – oestrone and progesterone. Vitamins – Classification of vitamins – Sources and deficiency diseases of vitamins A, B_1, C, D, E and K (structure not required).

Unit V – Chemistry of a few useful compounds **(12 hours)**

Preparation and uses of CH_2Cl_2, $CHCl_3$, CCl_4, CF_2Cl_2, Bleaching powder, Phenyl, Talcum powder, Shampoo, Shave lotion, Soaps and Detergents.

Reference Books

Unit-I

1. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand & Co., 2004.
2. B.R.Puri, L.R.Sharma and S.Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2005.

Unit-II

1. B.S.Bahl and Arun Bahl, A Textbook of Organic Chemistry, S.Chand & Company Ltd, Ram Nagar, New Delhi,16th edition, 2002.
2. K.S.Tewari, N.K.Vishnol and S.N. Mehrotra A Textbook of Organic Chemistry, 3rdrevised edition, 2006.
3. P.L.Soni and H.M.Chawla, Textbook of Organic Chemistry, Sultan Chand & Sons,

NewDelhi,2007.

Unit-III

1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2010.
2. B.K. Sharma, Instrumental methods of Chemical Analysis, Goel Publishing House 23rd Edition, 2004.

Unit-IV

1. S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co. Ltd., 2008.
2. K.S.Tewari N.K.Vishnol and S.N. Mehrotra A Text book of Organic Chemistry, 3rd revised edition, 2006.
3. Jaya shree Ghosh, Fundamental Concept of Applied Chemistry S.Chand & Company LTD, 2008.

Unit-V

1. R.D.Madan, Satya Prakash's Modern Inorganic Chemistry, S.Chand & Co. Ltd., New Delhi, 2008.
2. B.R.Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic Chemistry, S.Chand & Co., 2008.
3. P.L. Soni, Textbook of Inorganic Chemistry, Sultan Chand & Sons, 2008.
4. P.K.Chattopadhyay, Modern Technology of Soaps, Detergents and Toiletries, 2nd edition, 2005.
5. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 6th edition, 1994.

Course Name : Bachelor of Science
Discipline : Botany

ANNEXURE II

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core V	Biochemistry and Biotechniques	5	5	25+75=100	U3BYC51	SkillDevelopment	5 %
	Core VI	Genetics and Plant Breeding	5	5	25+75=100	U3BYC52	Skill Development	10 %
	Core VII	Taxonomy of Angiosperms	4	4	25+75=100	U3BYC53	Skill Development	25 %
	Core Practical V	Lab: Biochemistry and Biotechniques, Genetics and Plant Breeding & Taxonomy of Angiosperms	6	3	40+60=100	U3BYC5P	Skill Development	15 %
	Allied (b) - III	Cell Biology, Developmental Biology, Physiology, Immunology and Evolution	4	4	25+75=100	U3ZYA5X3		Revised / 40%
	Allied (b) – Practical III	LAB: Cell biology, Developmental biology, Physiology, Immunology and evolution & Commercial Zoology	2	-	----	---		
	Skill V – General Studies	Employability Skills	2	2	25+75=100	U1PS51	Employability	No change
	NME I	Plant Resources and Utilization	2	2	25+75=100	U3BYN51	Employability, Entrepreneurship	10 %

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
VI	Core VIII	Plant Physiology	5	5	25+75=100	U3BYC61	Skill Development	5 %
	Core IX	Microbiology and Biotechnology	5	5	25+75=100	U3BYC62	Employability, Skill Development	New Paper
	Core X	Organic Farming	4	4	25+75=100	U3BYC63	Employability, Entrepreneurship, Skill Development	New Paper

	Core Practical VI	Lab: Plant Physiology, Microbiology & Biotechnology and Organic Farming	6	4	40+60=100	U3BYC6P	Employability, Entrepreneurship, Skill Development	New Paper
	Allied (b) - IV	Commercial Zoology (Vermiculture, Apiculture, Aquaculture and Poultry Science and Dairy Farming)	4	4	25+75=100	U3ZYA6X4		Revised / 20%
	Allied (b) - Practical IV	LAB: Cell biology, Developmental biology, Physiology, Immunology and evolution & Commercial Zoology	2	2	40+60=100	U3ZYA6PX		Revised / 20%
	Skill VI	Project work	2	2	25+75=100	U1BY6PR	Employability, Entrepreneurship, Skill Development	New Paper
	NME II	Mushroom Cultivation	2	2	25+75=100	U3BYN61	Employability, Entrepreneurship	2%

Self-Learning Course:

Subject	Semester	Credit	Ext =Tot	Subject Code
Food science and Nutrition	IV	5	100 = 100	U1BYSL51

SEMESTER - V
Core V - BIOCHEMISTRY AND BIOTECHNIQUES

Contact Hours per week: 5 hrs **Sub code: U3BYC51**
Contact Hours per Semester: 60 hrs **Credit: 5**

Course Outcomes:
Students, after successful completion of the course, will be able to

- Gain knowledge on fundamental biochemical principles such as bonding structure and function of biomolecules.
- Get insight about biomolecules.
- Acquaintance with basics of enzymes, classification and mechanism of enzyme action.
- Gain proficiency in handling basic instruments and laboratory techniques.

Unit I **12 Hrs**

Basic concepts of atoms, Bonding in biomolecules (Covalent and non-covalent interactions, Hydrogen bond, Electrostatic interactions, Hydrophobic interactions, Vander Waal's forces and their significance); Isomerism and its types; structure and properties of water and its biological significance; Henderson-Hasselbalch equation, Buffers (inorganic and organic) and their importance.

Unit II **12 Hrs**

Carbohydrates – classification, structure, properties and significance of mono, di and polysaccharides. Glucose, Sucrose, Starch and Cellulose - structure and function. Lipids - fatty acids (saturated and unsaturated fatty acids); Classification of lipids (simple, compound and derived lipids) and biological role of lipids.

Unit III **12 Hrs**

Amino acids - classification (based on polarity) - physical and chemical properties. Protein structure (primary, secondary, tertiary and quaternary structures), Protein classification (based on structure), properties and functions of protein.

Unit IV **12 Hrs**

Enzymes – classification, properties, mechanism of enzyme action, factors affecting enzyme action, enzyme inhibition (reversible;competitive and non-competitive;irreversible) – Co-enzymes and iso-enzymes, Enzyme regulation. Vitamins – classification (fat-soluble and water-soluble) and its deficiencies.

Unit V **12 Hrs**

Colorimeter: Working principle (Beer Law and Lambert's law) and applications; pH meter – Working Principle and application, Chromatography and its principle – Paper chromatography , Thin layer chromatography and Column chromatography and its application. Centrifuge – principle (sedimentation coefficient – Svedberg's unit), types of centrifuge and their uses.

Text Books:

- Jain, J. L. 2000. Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi.
- Satyanarayana, U. and U. Chakrapani, 2013. Biochemistry. Elsevier Co-published with Books and Allied Press, New Delhi
- Lea, P.J and Leegood, R.C. 2001. Plant Biochemistry and Molecular Biology, 2nd Ed. John Wiley and Sons Ltd., England.

Reference Books:

- Conn, E.E., Stump, P.K., Bruening and Doi, R.H. (2001).Outlines of Biochemistry, John Wiley & Sons, New York
- Nelson, D. L. and M. M. Cox. 2008. Lehninger Principles of Biochemistry. W. H. Freeman Publishers, New York.
- Berg, *J. M., J. L.* Tymoczko and L. *Stryer*, 2010. Biochemistry, W. H. Freeman Publishers, New York.

Core VI - GENETICS AND PLANT BREEDING

Contact Hours per week: 5 hrs **Sub code: U3BYC52**
Contact Hours per Semester: 60 hrs **Credit: 5**

Course Outcomes:

Students, after successful completion of the course ,will be able to

- Understand the natural hereditary mechanisms in living organism
- Impart knowledge in basic concepts at molecular level of organism
- Learn the principles and practices in plant breeding techniques.

Unit I **12 Hrs**

Mendel's law of inheritance. Monohybrid and Dihybrid cross- test cross- Interaction of gene- Incomplete dominance , Codominance. Complementary gene, Epistasis: dominant and recessive, Multiple alleles (ABO blood group), Polygenic inheritance.

Unit II **12 Hrs**

Linkage and crossing over – significance- linkage in maize, molecular mechanism of crossing over. Types of sex determination in plants. Extra chromosomal inheritance (plastid inheritance in *Mirabilis*). Gene mutation- induced and spontaneous – molecular basis- mutagens

Unit III **12 Hrs**

DNA as genetic material- structure of DNA and types of DNA - DNA replication (three types). RNA- types, structure and functions. Prokaryotic transcription and translation. Operon concept.- Lac operon

Unit IV **12 Hrs**

Eukaryotic genome organization–Genetic recombination in bacteria – Transformation, Transduction and conjugation.

Unit V **12 Hrs**

Principles of Plant breeding-Selfing and crossing techniques, Hybridization. Methods of selection - Mass, Pedigree, Bulk and back cross. Polyploidy and its applications, Heterosis. Mutation breeding-, applications of mutation breeding.

Institutional Visit to Sugarcane breeding institute, Tamilnadu Agricultural University, IFGTB,Coimbatore /any research institute.

Text Books:

- Veer Bala Rastogi. A Textbook of Genetics. Published by Kedar Nath and Ram Nath.
- Verma P.S and V.K Agarwal 1991.Cytology (Cell Biology and Molecular Biology). S. Chand & Co, New Delhi.
- B.D.Singh, Plant Breeding: Principles and Methods, Kalyani Publishers,2009.

Reference Books:

- Burns, G.W.1980 – The Science of Genetics, Collier acillan, New York
- Gardnet, E.J Simmons and Snustad, D.P 1985 – principles of Genetics. Edition 8, John Wiley & Sons, New York.
- Strickberger, M.W. 1999. Genetics. Prentice hall of India Pvt Ltd, New Delhi.
- Singh P.D 2000 Fundamentals of genetics. Kalyani Publishers, New Delhi.
- Gupta, P.K 2002. Genetics. Rastogi Publishers, Meerut.
- Mirta,S. 1994. Genetics. Rastogi publishers, Meerut.

Core –VII TAXONOMY OF ANGIOSPERMS

Contact Hours per week: 4 hrs **Subject Code: U3BYC53**
Contact Hours per semester: 60 hrs **Credit: 4**

Course outcomes:
Students, after successful completion of the course,will be able to

- Get interest in admiring the variations in the vegetative and floral morphology of Angiosperms.
- Understand the importance of herbarium and BSI.
- Understand the floral arrangement to identify the plant species.
- Gain knowledge on the economic importance of Angiospermic plants.

UNIT I **12 Hours**

Importance of Taxonomy, Classification – Linnaeus classification, Bentham and Hooker'sclassification & Engler and Prantl classification – APG system of classification (In brief) – Herbarium techniques, BSI ; Botanical nomenclature - ICBN Principles and rules.

UNIT II **12 Hours**

Vegetative morphology: Leaves – Phyllotaxy, simple and compound, Shape, Venation and its types, Stipules. Reproductive morphology - Inflorescence types: Racemose, Cymose and Special types. Perianth, Calyx, Corolla (arrangement and aestivation) Androecium (cohesion and adhesion) , Gynoecium (structure and placentation types). Types of fruits.

UNIT III **12 Hours**

Study of the following families with special reference to morphology and economic importance – Annonaceae, Nymphaeaceae, Malvaceae, Meliaceae, Caesalpiniaceae,.

Unit IV **12 Hours**

Study of the following families with special reference to morphology and economic importance – Rubiaceae, Asteraceae, Apocynaceae, Acanthaceae, Verbenaceae

UNIT V **12 Hours**

Study of the following families with special reference to morphology and economic importance – Nyctaginaceae, Euphorbiaceae, Amaryllidaceae, Arecaceae, Poaceae

***A minimum of three days Field trip to Hill stations / Research Institutes**

Text Books:

- Dutta A.C (2008) Botany for degree students (6th edition). Oxford university press
- Pandey, S.N and Misra, S.P (2008) Taxonomy of Angiosperms. Ane books India, New Delhi.

Reference Books:

- George H.M. Lawrence (1964) Taxonomy of vascular plants, Oxford and IBM publishing co. New Delhi.
- Michael G.Simpson (2019) Plant Systematics (third edition),Academic Press
- Vasishta P.C (2001) Taxonomy of Angiosperms. S.Chand & company, New Delhi
- Pandey, B.P (2001) Taxonomy of Angiosperms. S.Chand & company, New Delhi

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LAB - V: BIOCHEMISTRY and BIOTECHNIQUES, GENETICS and PLANT BREEDING & TAXONOMY OF ANGIOSPERMS

Sub code: U3BYC5P **Credit: 3** **Hours/week=6**

PRACTICAL SYLLABUS

Course Outcomes:

- Gain proficiency in handling basic instruments and laboratory techniques.
- Understand the natural hereditary mechanisms in living organisms.
- Learn the principles and practices in plant breeding techniques.
- Understand the floral variations among plant species

BIOCHEMISTRY and BIOTECHNIQUES

- Determination of the pH of different solutions
- Titration of weak acid with a strong base
- Determination of Rf value of amino acids by paper chromatography
- Verification of Beer's and Lambert's law
- Estimation of starch in plant tissue by gravimetric method
- Estimation of amino acid by Ninhydrin method
- Estimation of protein by Lowry et al method method
- Qualitative tests for carbohydrates, proteins, amino acids and lipids

GENETICS AND PLANT BREEDING

- Solving Problems related to Monohybrid, Dihybrid crosses, Test cross, Incomplete dominance, co-dominance
- Problem related to complementary gene, epistasis,
- Study of polygenic inheritance for quantitative traits in plants such as length of pods and leaves, number of seeds in fruits
- Emasculation techniques, various breeding experiments.

TAXONOMY OF ANGIOSPERMS

Refer angiosperm plants to their respective families giving reasons.

- Describe the plant in technical terms. (Draw labelled diagrams of the floral parts including longitudinal sections of the flower, construct the floral diagram and give the floral formula.)
- Identify the local angiosperms / from the herbarium collected during the field study.
- Preparation of Herbarium. (15 plants)
- **Go for field study under supervision for minimum of three days to acquaint with the flora of Hills.**

Botany Major Practical Question

BIOCHEMISTRY AND BIOTECHNIQUES, GENETICS AND PLANT BREEDING & TAXONOMY OF ANGIOSPERMS

Time: 3 hours Max marks: 60

1.	Taking a lot from the set of experiments, submit the procedure, tabulate and interpret the results.	10 marks
2.	Solve the given genetic problems **A** & **B** (2X5=10)	10 marks
3.	Refer specimen **C** to its respective family giving reasons (sketches not required)	5 marks
4.	Describe specimen D in technical terms; draw labeled sketches of floral parts including L.S of the flower. Construct the floral diagram and write the floral formula	8 marks
5.	Write genus and family of the given specimen **E**	2 marks
6.	Identify, draw diagrams and write notes on **F, G** and **H**	3X 5 = 15marks
7.	Submission of Record note books	10 marks

Key & Scheme of Valuation

1.	Biochemistry experiments: Procedure 4 marks, Table, Interpretation of results 6 marks.	10 marks
2.	Genetics problems: value as whole (5 marks)	2 x 5 = 10 marks
3.	C - Taxonomy: family identification - 1 mark, reasoning - 4 marks	5 marks
4.	D - Taxonomy: Technical description of flower - 3 marks, L.S flower diagram - 2 marks, floral diagram - 2 marks and floral formula - 1 mark	8 marks
5.	E - Taxonomy: Genus - 1 mark, family - 1 mark	2 marks
6.	Spotters : F – from Biochemistry & Bio-techniques G & H – from Genetics & Plant Breeding Identification - 1 mark, Diagrams - 2 marks, Notes - 2 marks	3 X 5 = 15 marks

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CELLBIOLOGY, DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, IMMUNOLOGYAND EVOLUTION

Contact hours per Week – 4 hours **Subject Code: U3ZYA5X3**
Contact hours per Semester – 60 hours **Credits: 2**

Objectives

- To understand various structure and functions cell and organelles
- To Study about the development and function of various organs in animal body
- To find out ancestral development in earth

Unit I **(12 hours)**

Cell Biology

Structure and functions of animal Cell- cell membrane- cell organelles- mitochondria, endoplasmic reticulum, Golgi complex, ribosomes. Cancer- site of infection- types- causes – treatment.

Unit II (**12 hours)**

Developmental Biology

Structure of sperm and ovum in frog- Gametogenesis-cleavage, blastulation and gastrulation. Human reproductive system, birth control –Test tube baby.

Unit III **(12 hours)**

Physiology

Digestion and absorption of Carbohydrates, proteins and lipids- Structure of Nephron. Neuron and conduction of Nerve impulse.

Unit IV (**12 hours)**

Immunology

Types of immunity (Innate and Acquired immunity) - Lymphoid organs (Primary and Secondary)– Immunoglobulin-IgG- Antigen antibody reactions.

Unit V (**12 hours)**

Evolution

Paleontological evidences for evolution- Lamarckism- Darwinism- Modern synthetic theory, Allopatric and sympatric speciation- cultural evolution of man.

Text Books

1. Cell Biology, Molecular biology, Genetics, Immunology, And Biotechnology, Arumugam. N. (2007), Saras publication, Nagercoil.
2. Physiology, Developmental biology, Biochemistry, Microbiology and Evolution, Arumugam. N., (2007), Saras publication, Nagercoil.

Reference Books

1. Chordate embryology, PS Verma & VK .Agarwal, (2012), Chand Publication
2. Fundamentals of biochemistry for medical students, Ambika Shanmugam (2007),
3. Evolution, Veera bala Rastogi-.
4. Animal Physiology, Rastogi-
5. Immunology –Ivan Roitt

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**

Course Outcomes :

Students, after successful completion of the course ,will be able to

- Enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **6 hours**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **6 hours**

Unit III: Reasoning **6 hours**
Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **6 hours**
Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: General Knowledge **6 hours**
Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME - PLANT RESOURCES AND UTILIZATION

Contact Hours per week: 2 hrs **Sub code: U3BYN51**
Contact Hours per Semester: 30 hrs **Credit-2**

Course outcomes:
Students, after successful completion of the course,will be able to

- Develop their understanding on Plants morphology and Uses.
- Increase the awareness and appreciation of plants & plant products encountered in everyday life.
- Develop a basic knowledge of taxonomic diversity of plants and its economic importance.
- Understand core concepts of Economic importance of Plants and their value added processing plants in human use.

Unit I **6 Hrs**

Brief Study of the following economic produces with special reference to botanical name, family, morphology of the useful parts and uses; Cereals – Paddy, Wheat; Pulses - Red gram, Black gram; Fruits - Banana, Mango.

Unit II **6 Hrs**

Brief Study of the following economic produces with special reference to botanical name, family, morphology of the useful parts and uses. Spices and Condiments: Garlic, Cardamom, Pepper and Ginger; Dyes – Indigo; Nuts – Cashew and Almond

Unit III **6 Hrs**

Brief Study of the following economic produces with special reference to source, family, morphology and uses Latex - rubber, Oil- Gingelly, Coconut; Tannins - Myrobalan, Resins and gums - Oleoresin, Canada balsam and Turpentine

Unit IV **6 Hrs**

Brief Study of the following economic produces with special reference to botanical name, family, morphology and uses: Essential oil- Lemon grass oil, sandalwood oil; Wood -Teak wood, neem and rose wood; Medicinal- Common periwinkle and Amla

Unit V **6 Hrs**

Methods of Processing: Tea, Coffee, Extraction of Eucalyptus oil, preparation of Aloe gel; Importance of Ethnobotany in Indian context.

Text books: H.D.Kumar .Economic Botany.2003.Macmath Publications.New Delhi

Reference Books: Dr.V.Singh .C.Pandey• &J.K.Jain. Economic Botany.2012.Rastogi publications. New Delhi.

Semester – VI

CORE VIII - PLANT PHYSIOLOGY

Contact Hours per week: 5 hrs **Sub code: U3BYC61**
Contact Hours per Semester: 60 hrs **Credit-5**

Course Outcomes:

Students, after successful completion of the course, will be able to

- Impact an insight into the various plant water relations.
- Understand the mechanism of various metabolic processes in plants.
- Acquire basic knowledge about growth and development in plants.
- Equip students with skills and techniques related to plant physiology so that they can design their own experiments.
- Take students to higher levels of learning about the mineral nutrition in plants.

Unit I **12 Hrs**

Absorption of water – imbibition, diffusion, osmosis, plasmolysis. Mechanism of water absorption – active and passive. Ascent of sap – path of ascent of sap, mechanism of ascent of sap, physical force theories. Transpiration –Types - stomatal,cuticular and lenticular. Mechanism of stomatal movement,Transpiration a necessary evil. Factors affecting transpiration. Guttation

Unit II **12 Hrs**

Mineral nutrition – Macro (N,P,K &Mg) and micro(Bo,Cu &Zn) its physiological role and its deficiency symptoms. Sand culture, Hydroponics, and Aeroponics. Photosynthesis – photosynthetic unit. Site of photosynthesis. Light reaction – two photosystems, Electron transport ,Photophosphorylation – cyclic and non-cyclic. Dark reaction – Calvin cycle, Hatch and Slack pathway, C_2 cycle.

Unit III **12 Hrs**

Respiration – types of respiration – aerobic and anaerobic, site of respiration, respiratory substrates. Mechanism of respiration – Glycolysis, Kreb's cycle, Electron transport and oxidative phosphorylation. Nitrogen fixation – symbiotic and asymbiotic

Unit IV **12 Hrs**

Physiology of flowering – Photoperiodism, cryptochrome, Phytochrome. Vernalization. Plant growth hormones – physiological effects of auxins, gibberellins, cytokinins and ethylene. Seed dormancy – Factors affecting seed dormancy. Methods of breaking seed dormancy.

Unit V **12 Hrs**

Plant movements : Autonomic – ciliary, amoeboid, cyclosis Paratonic – phototaxis, chemotaxis, thermotaxis and thigmotaxis. Tropic movements – phototropism, geotropism, hydrotropism. Movement of Curvature – nutation and nastic movement (nyctinastic, seismonastic, thigmonastic)

Text Books:

- S.N. Pandey and B.K. Sinha, Plant physiology –Vikas Publishing house 1999.
- Subash chandra dutta ,Plant physiology- New Age International (P) Limited, Publishers; First edition (2007)
- S.K.Verma, Text Book of Plant Physiology –S.Chand and company,New Delhi, 2003.

Reference Books:

- R.K. Sinha , Modern Plant physiology –Narosa Publishing house New Delhi, 2004.
- Devlin and Witham, Plant Physiology – CBS Publishers and Distributors, 1999
- Salisbury and Ross ,Plant Physiology –CBS Publishers and distributors ,Delhi 1995.

CORE-1X MICROBIOLOGY AND BIOTECHNOLOGY

Contact Hours per week : 5 hrs **Sub code: U3BYC62**
Contact Hours per Semester : 60 hrs **Credit : 5**

Course Outcomes:

Students, after successful completion of the course ,will be able to

- Develop their knowledge about microbes.

- Create awareness on sewage water treatment, preservation of food products and antibiotics
- Build up the knowledge on tissue culture and its applications.
- Understand the multidisciplinary approaches in the field of biotechnology.

Unit I **12 Hrs**

Historical background of Microbiology - Bergey's classification of Bacteria - General and morphological characteristics of Bacteria – Ultra structure of bacterial cell. Reproduction in Bacteria, Growth curve, Methods of measurement of bacterial growth, Nutritional types of bacteria.

Unit II **12 Hrs**

Viruses - Characteristics, Classification of virus based on Symmetry and Nucleic acids. Structure of TMV. Structure and reproduction of Bacteriophage -T_4 Phage.

Unit III **12 Hrs**

Sewage treatment – oxidation pond and trickling filter. Spoilage of food (Perishable and non perishable)and preservation techniques, Microbiology of milk and milk products, Pasteurization of milk. Disinfectants. Structure and mode of action of Antibiotics - Penicillin, Streptomycin and Tetracycline.

Unit IV **12 Hrs**

Scope – definition, multidisciplinary approach of biotechnology, Introduction to gene cloning, Vectors: Plasmids – pBR322: Bacteriophage vectors- M13.Ti plasmid based vectors Restriction endonucleases, DNA ligases, DNA Polymerase (Taq), Reverse Transcriptase. Blotting techniques. – southern and western. Tissue culture: Protoplast culture, micro propagation, embryo culture. Artificial seeds. Application of Tissue culture.

Unit V **12 Hrs**

Methods of gene delivery - direct gene transfer using PEG, Electroporation, Biolistics, Microinjection and Liposome mediated. Identification of recombinants - Insertional inactivation of antibiotic resistance marker gene-Inactivation of Lac Z gene, Selection of recombinant phages, Colony Hybridization.

Text books:

- Powar, C.B and M.E. Daginawala – General Microbiology Vol- 1 and Vol-II 2011
- A.S Rao. Introduction to Microbiology. 2012
- P.D Sharma – Microbiology and Plant pathology. 2009
- R.C. Dubey, 2006A text Book of Biotechnology , - S. Chand & Company Ltd, Ram Nagar, New Delhi.
- Kalyan Kumar De., 1992 .Plant tissue culture, - New central book Agency P .Ltd, Calcutta.
- Shanmugavel,P.2005.Principles of Bioinformatics. Pointer Publishers,Jaipur,India

References books:

- Pelczar, M.J. Chan, E.C.S. and Krieg, N.R. 1993 – Microbiology- Concepts and application. Mc Grew Hill, Inc. New York.
- R.C Dubey and D.K. Maheshwari. A text book of Microbiology- S.Chand &Company Ltd, New Delhi.
- Kumar, H.D. and Swati Kumar, 1999. Modern Concepts of Microbiology. Vikas Publishing House Pvt.Ltd. New Delhi.
- Brown, C.M, Campbell, I. and Priest, F.G, 1990. Introduction to Biotechnology. Blackwell Scientific publications Oxford, London.
- Brown, T.A, 1999. Genomes. John Wiley & Sons. Newyork.
- Chawla, H.S. 2000. Introduction to plant biotechnology. Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.
- Dixon, R.A and Gonzales, R.A (Eds.) 1994. Plant Cell Culture- A Practical Approach. Oxford University Press, Newyork.

Core X - ORGANIC FARMING

Contact Hours per week : 4 hrs **Sub code: U3BYC63**
Contact Hours per Semester : 60 hrs **Credit : 4**

Course Outcomes:

Students, after successful completion of the course, will be able to

- Know the values of organic waste and their utilization by adopting different technologies.
- Assess the nutritive value of organic products.
- Get awareness on organic agriculture.

Unit I **12 Hrs**

Farming, organic farming, concept and development of organic farming. Principles of organic farming & Need for organic farming, Agencies and institutions related to organic agriculture, Types of organic farming, Biodynamic farming, Benefits of organic farming. Differences between Conventional farming v/s organic farming.

Unit II **12 Hrs**

Manures and Fertilizers – definition, differences, classification – major nutrient fertilizers – N,P, K fertilizers – secondary and micronutrient fertilizers – complex and mixed fertilizers – losses of nutrients from soil – biofertilizers – plant growth regulators – Preparation of Enriched farm yard manure and micro nutrient mixtures.

Unit III **12 Hrs**

Erection of Vermicompost unit, Drainage arrangement and collection of the liquid, Raising leguminous crops around the pit, Collection of raw materials & Processing, introducing active worms (specific sps.) and processed raw materials in the pit, Collection of final product . Vermi wash.

Unit IV **12 Hrs**

Some Other forms of Organic Management and Inputs: Biodynamic Agriculture, Rishi Krishi, Panchgavya Krishi, Natural farming, Natueco Farming, Homa Farming, Effective microorganism Technology

Unit V **12 Hrs**

Organic Management: Developing organic farm, Conversion of soil to organic, Multiple cropping and crop rotation, Crop rotation, Seed/ Planting material Treatment, Manuring and soil enrichment, Use of Biofertilizers and microbial cultures, Some important formulations for soil enrichment, Management of Temperature, Protection to all life forms, Pest management

Text Books

- A.K. Sharma, A hand book of organic farming –Agrobios publication.
- A.K Yadav Organic Agriculture (Concept, Scenario, Principals and Practices) Director National Centre of Organic Farming, Ghaziabad

Reference Books

- A.K. Dahama, Organic farming for sustainable Agriculture –Agrobios.
- Rana S.S 2011, Organic Farming - Department of Agronomy, College of Agriculture, CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur.

PRACTICAL SYLLABUS

LAB: PLANT PHYSIOLOGY, MICROBIOLOGY AND BIOTECHNOLOGY & ORGANIC FARMING

Sub code: U3BYC6P **Credit:4** **Hours/week=6**

Course Outcomes:

Students, after successful completion of the course, will be able to

- Understand the mechanism of various metabolic processes in plants.
- Acquire basic knowledge about growth and development in plants.
- Create awareness on sewage water treatment, preservation of food products and antibiotics
- Build up the knowledge on tissue culture and its applications.
- Impart Knowledge on organic waste and their utilization by adapting different technologies.
- Assess the nutritive value of organic products.
- Know the importance of organic agriculture.

PLANT PHYSIOLOGY

To carry out the following experiments and explain the working principle, observation, Results & Interpretations.

- Imbibition – Direct weight method.
- Osmotic pressure – Plasmolytic method.
- Rate of transpiration – Farmer's Potometer.

- Rate of Photosynthesis – Test tube Funnel method.
- Separation of photosynthetic pigments- Paper chromatography method.
- Demonstrate the Physiological Experiment set up.
- Potato osmoscope.
- Bell – jar experime nt
- Ganong's Potometer
- Kuhne's fermentation
- Ganong's Light screen
- Mohl's half leaf experiment.
- Measurement of growth using Lever Auxanometer.
- Geotropism
- Phototropism.
- Hormones

MICROBIOLOGY AND BIOTECHNOLOGY

- Basic equipments used in Microbiology Laboratory.
- Sterilization of glass wares and culture media
- Motility of Bacteria – Hanging drop method.
- Gram staining of bacteria
- Preparation of culture media – Nutrient Broth, Nutrient Agar, Potato Dextrose Agar.
- Isolation of microorganisms from environment.
- Isolation of DNA from tender coconut endosperm.
- Quantitative estimation of DNA.
- Agarose gel electrophoresis - Demonstration
- Blotting techniques.
- Plant tissue culture - Demonstration

ORGANIC FARMING

- Demonstration of Vermi compost preparation.
- Preparation of Panchagavya Krishi
- Biofertilizer.

Industrial Visits and Educational Institutional visits for a minimum of two days

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V.H.N.SENTHIKUMARA NADAR COLLEGE (AUTONOMOUS)
DEPARTMENT OF BOTANY
B.SC PRACTICAL SEMESTER EXAMINATION
PRACTICAL QUESTION
Plant Physiology, Microbiology And Biotechnology & Organic Farming

Duration : 3 Hrs **Max marks=60**

1. By taking lot, write the procedure, do the physiology experiment, and interpret the results 15 Marks

2. Comment on the physiology set up "A" 5 Marks
3. Prepare the Hanging Drop for "B" & submit the slide for valuation. 5 Marks
4. By taking a lot, do the experiment and interpret the result 10 Marks
5. Write critical notes on C, D & E (3X5) 15 Marks
6. Submission of record note books 10 Marks

Key & Scheme of Valuation

1. Physiology experiment - Procedure- 15 Marks
2. Physiology set up A- Diagram-2, Comments-3. 5 Marks
3. B - Hanging Drop 5 Marks
4. Organic farming - Experiment-4, Procedure-3, interpretation- 3 10 Marks
5. C- Plant Physiology, D- Microbiology and Biotechnology, E-Organic farming Identification -1 diagram-2 Notes-2 (3X5) =15 Marks
6. Submission of record note books 10 Marks

COMMERCIAL ZOOLOGY
(VERMICULTURE, APICULTURE, AQUACULTURE AND POULTRY SCIENCE AND DAIRY FARMING)

Contact hours per Week – 4 hours **Subject Code: U3ZYA6X4**
Contact hours per Semester – 60 hours **Credits: 4**

Objectives

- To understand the concepts of maintain animals like earthworms, honey bees, fishes, chicks and cattle.
- To develop the students as entrepreneur of the zoology

Unit I **12 hours**

Vermiculture

Cultivatable species of earthworms-*Eisenia fetita, Endrilus eugeniae, Perionyx excavates* and *Lampito mauritti* - Vermicomposting methods (Pit, Heap, Tray and Bed methods) -conditions required for vermicomposting- vermicast- vermiwash.

Unit II **12 hours**

Apiculture-Life history of honey bee, kinds of honey bee-types of hives-newton's hive and other appliances, enemines (Bee wax moth and Wasps) and diseases of honey bee (*Nosema* and *Acarine* deseases) –Medicinal values of honey.

Unit III **12 hours**

Aquaculture –scope of aquaculture –aquaculture in India-Culturable organisms (Cata, Rohu and Mrigal) - construction of fish pond-Culture of Indian major carps, induced breeding-prawn culture- pearl culture.

Unit IV **12 hours**

Poultry science

Breeds of fowls-poultry industry in India-Choosing of parents- sexing of day old chick construction of poultry house- deep litter system- Cage system-Rearing of layers and broilers-nutritive value of egg-poultry diseases (common diseases like Raniket diseases, coryza, fowl pox, polyneuritis, coccidiosis, curled toe)

Unit V **12 hours**

Dairy farming

Importance of dairy farming, dairy animals-cattle cow –buffalo-goat (any one example to each)-management of a model dairy farm-live stock diseases- foot and mouth diseases, udder diseases, Rinder pest – nutritive values of milk and milk products.

Text Books

1. Arumugam .n, Murugan.T,Johnson Rajeswar.J,Ram Prabhu.R, 2009 Applied zoology,saras publication,Nagarkovil

Reference Books

1. Sharma, Bee Keeping in India, ICAR Publications.
2. Ganamani.M.R., 2010 Modern aspects of Commercial poultry keeping, Giri Publications, Madurai
3. Sulthan Ismail,Vermitechnology, Chennai
4. Jamson and Santhanakumar, Concepts of Aquaculture,

LAB: CELLBIOLOGY, DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, IMMUNOLOGYAND EVOLUTION & COMMERCIAL ZOOLOGY

(To be done at the end of the Sixth semester)

Contact hours per week 2 hours. **Subject Code: U3ZYA6PX**
Contact hours per semester 30hours **CREDITS: 2**

List of Practical

1. Preparation of Onion root tip and observe the Mitotic stages.
2. Preparation of Squamous epitheilial cells.
3. Qualitative test for Ammonia, Urea and Uric acid.
4. Qualitative test for Protein, Carbohydrate and lipids.
5. Mounting of mouth parts , sting of Honey bees- Demo only

List of Spotters

1 Mitochondria , Golgi Body , Endoplasmic reticulum, lysosome and Ribosome
2 Mitosis –Stages identification
3 Meiosis -stages identification
4 Following stages of frog embryo i)Egg ii)Sperm iii)Blastula iv) Gastrula
5 Primary lymphoid organ – Thymus.
6 Secondary lymphoid organ – Spleen.
7 Paper cutting of Giraffe neck growth to explain Lamarckism
8 Identification of Catla ,Roghu, Mrigal
9 Model fish pond
10 Vermicompost

11 Newton's hive
12 Poultry feeds, feeder and waterers
13 Milk and their by products.

PROJECT

Hours/week-2 Sub code: U1BY6PR Credit-2

Objectives:

- To train the student in various spears of learning skills like critical thinking, creativity, synthesis of knowledge, analyzing capacity, instrument basics and handling and scientific report writing.
- To introduce the frontiers areas of research in botany among students
- To understand the scope of research programme in Botany
- The project work (field/ lab work) is to inculcate students to learn adequate knowledge on research methodology in the subject and prepare them for pursuing research in experimental areas of the subject.

Project will be carried out by the final year students in the sixth semester under the guidance of respective guides. The Project work or Field Study is to be undertaken under the guidance of a Teacher of the Department. Projects will be carried out in groups (with maximum of 5 students per group). For projects internal marks (max 50) will be awarded by the respective guide and external marks (max 50) will be awarded by the external examiner during summative practical examination.

Non Major Elective - MUSHROOM CULTIVATION

Contact hours per Week – 2 hours **Subject Code: U3BYN61**
Contact hours per Semester – 30 hours **Credits: 2**

Course Outcomes:

Students, after successful completion of the course ,will be able to

- Explore mushroom cultivation and its economic importance.
- Understand about mushroom spawn preparation for mushroom cultivation and mushroom marketing

Unit I **6 Hrs**

History of Mushroom Cultivation, General Characters of Mushroom-Morphology of Common edible and Poisonous Mushrooms.

Unit II **6 Hrs**

Spawn & Spawning – Different kinds of Spawn (Virgin Spawn, Flake spawn, Brick spawn, Grain Spawn) – Grain spawn production - Advantages of grain spawn- Factors determining spawn production – Methods of spawning, Storage of Spawn.

Unit III **6 Hrs**

Mushroom Cultivation & Harvesting - Paddy straw mushroom, Button Mushroom, and Oyster mushroom, post harvesting technology of Mushrooms

Unit IV **6 Hrs**

Disease of Mushrooms – Bacterial, Fungal, Insect Pest and Nematodes.

Unit V **6 Hrs**

Food and Medicinal value of edible mushrooms, Economic importance of mushrooms, Recipes of Mushroom, Packing and marketing of mushroom.

Text book:

- Nita bahl 2009. Handbook on Mushrooms. Oxford & IBH Publishers, New Delhi

Reference books:

- Tripathi.D.P 2005. Mushroom Cultivation. Oxford & IBH Publishers, New Delhi
- Muthusamy. A.D & Yesuraja.I 1999. Mushrooms Culture, TNAU Publishers, New Delhi

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Courses Name: Bachelor of Science
Discipline : Botany

Self-Learning Course:

Subject	Semester	Credit	Ext =Tot	Subject Code
Food science and Nutrition	IV	5	100 = 100	U1BYSL51

Self-Learning
Food science and Nutrition

TOTAL MARKS : 100 **Credit: 5** **Subject Code: U1BYSL51**

Objectives

1. To have a broad outline of the methodology of food science
2. To enable students to apply scientific methods independently
3. To understand the nature of unit operations in the food industry.

Unit I

Food pyramid, functions, classification, conservation of nutrients, cooking methods, meal planning for different age & income groups, food adulteration of food safety and Weaning foods – meaning, importance and preparation.

Unit II

Nutrition – Definition of nutrients, components, requirements, metabolism – carbohydrate, protein and fat, Normal and therapeutic nutrition, nutritional deficiency.

Unit III

Art in food service - Design, selection, structural and decorative, design and their application in food service institutions. a) Colour - Colour schemes. b) Flower arrangements - Types and styles c) Table service - Styles - Indian, Western and oriental.

Unit IV

Preservation of Food – Milk Based; Millet Based preparation of canned food; Fermented Food; Colouring and preservative agents and its disadvantage.

Unit V

Concept of Extension – Principles and scope; Science and technology, health promotion, environmental sanitation; programme planning for women and children and transaction, ICDS programme and role of different functionaries.

REFERENCES:

1. Potter, N.N. Food Science 5th edition. CBS publishers and distributors, New Delhi. 1996.
2. Kroger, M and Shapiro, R. Changing food technology. (Vol. 1-3) Technomic publishing Co. Inc, USA. 1987.
3. Raj, G.D. Encyclopaedia of Food Science. (Vol 1-3). Anmol publications Pvt. Ltd, New Delhi. 1997.
4. Kumar, A and Meenakshi, N. Marketing management. Vikas publishing house Pvt. Ltd. 2006.
5. Srilakshmi, B. Nutrition Science, New age International (P) Ltd publishers, New Delhi. 2006.

Course Name: Bachelor of Science
Discipline : Microbiology
(Who those joined in the year after June 2018)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core 9	Microbial Genetics Molecular Biology	4	4	25+75=100	U2MBC51	Nil	No Change
	Core 10	Environmental and Agricultural Microbiology	4	4	25+75=100	U2MBC52	Nil	No Change
	Core 11	Medical Microbiology	4	4	25+75=100	U2MBC53	Nil	No Change
	Core12 Lab	Major Practical V LAB: Environmental, Agricultural and Medical Microbiology	6	3	40+60=100	U3MBC5P	Nil	Revised 25%
	Allied 13	Introduction to Pharmacognosy	4	4	25+75=100	U3MBA51	Nil	New
	Allied14 Lab	Pharmacognosy and Pharmacology	2	---	--	---	Nil	New
	SBE 3	Mushroom Technology	2	2	25+75=100	U2MBS51	Nil	No Change
	SBE 4	Employability Skills	2	2	25+75=100	U1PS51	Nil	No Change
	NME 1	Introduction to Microbiology	2	2	25+75=100	U3MBN51	Nil	No Change
VI	Core 13	Recombinant DNA (rDNA) Technology	4	4	25+75=100	U3MBC61	Nil	Revised 5%
	Core 14	Food and Industrial Microbiology	4	4	25+75=100	U3MBC62	Nil	Revised 20%
	Core 15	Research Methodology and Bioinformatics	4	4	25+75=100	U3MBC63	Nil	New & Revised 90%
	Core16 Lab	Major Practical VI LAB: Recombinant DNA Technology, Food and Industrial Microbiology	6	4	40+60=100	U3MBC6P	Nil	Revised 20%
	Allied 15	Basic concept of Pharmacology	4	4	25+75=100	U3MBA61	Nil	New
	Allied16 Lab	LAB: Pharmacognosy and Pharmacology	2	2	40+60=100	U3MBA6P	Nil	New
	SBE 5	Project	4	4	40+60=100	U1MB6PR	Nil	New
	NME 2	Applied Microbiology	2	2	25+75=100	U4MBN61	Nil	New

Self-Learning Course:

Subject	Credit	Ext =Tot	Subject Code
Food Quality Analysis	5	100 = 100	U1MBSL51

MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Hours per week -4 **Credit : 4**

Hours per Semester-60 **Subject code : U2MBC51**

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Understand the basic concepts of microbial genetics and gene expression which are essential for the biology and evolution of microorganisms.

CO2 : Improve the knowledge on genetics of microbes and basic concepts of operons.

CO3 : Know about the mutations that occur in microbial genome and their repair mechanisms.

Unit I **(12 hours)**

Nucleic acids as hereditary material: DNA as genetic material (Griffith and Hershey – Chase experiment). Structure of nucleic acid: DNA double helix (Watson and Crick's model of DNA) – Different forms of DNA – B DNA, A DNA and Z DNA. Types of RNA – rRNA, mRNA and tRNA (Clover leaf model). Genetic recombination in Bacteria: Transformation, Conjugation and Transduction.

Unit II **(12 hours)**

Mutation types: Spontaneous mutation-evidence for spontaneous mutation, Point mutation (Replica Plating).Transition and Transversion. Induced mutation: Chemical mutagens and Physical mutagens. Point mutation, Suppressor mutation, Frameshift mutation. DNA repair mechanism: Photoreactivation, Excision repair and Recombination repair.

Unit III **(12 hours)**

DNA Replication: Types of DNA replication – Theta model, Rolling circle model. DNA replication is semiconservative (Meselson and Stahl experiment). Enzymes involved in bacterial DNA replication: DNA Polymerase, Topoisomerase. Mechanism of DNA replication in prokaryotes (in *E.coli*).

Unit IV **(12 hours)**

Transcription: organization of transcriptional units – RNA polymerase and mechanism of transcription in prokaryotes. Translation: Genetic code, Wobble hypothesis and the mechanism of translation.

Unit V **(12 hours)**

Gene regulation and expression: Operon concept – Structure of prokaryotic operon – *lac* operon, *trp* operon and *ara* operon

Text Books:

1. Freifelder, D., Malacinski, G.M., 1987, Essentials of Molecular Biology, John and Bartlett Publishers, London.
2. Prescott, Harley & Klein, 2008, Microbiology, 6/e, The McGraw Hill Companies, US.
3. Freifelder, D., Malacinski, G.M., 1987, Essentials of Molecular Biology.
4. Prescott, Harley & Klein, 2008, Microbiology, 6/e, The McGraw Hill Companies, US.
5. Arumugam, N, 2015, Cell and Molecular Biology, Saras Publication, Nagercoil.
6. Nelson, D. and Cox, M., 2005, Lehninger Principles of Biochemistry, 4/e, W.H. Freeman and Company, New Delhi.
7. Turner, P., McLennan, A., Bates, A. and White, M., 2005, Molecular Biology, 3/e, Taylor and Francis Group, New York.
8. Arumugam, N., 2015, Cell and Molecular Biology, Saras Publication, Nagercoil.

Reference Books:

1. David Freifelder, 1987, Essential of Molecular Biology, Narosa publishing House, New Delhi.
2. Benjamin Lewin, 2007, GENE IX, Oxford University Press, US.
3. Watson, Baker, Bell, Gann, Levine, Losick., 2004, Molecular biology of the gene, 7/e, Pearson publications, India.
4. Kumarasan, V., 2001, Biotechnology, Saras Publication, Nagercoil, Tamil Nadu.
5. Click B.R. and Paeric Jack.J., 2008, Molecular Biotechnology, ASM Press, London.
6. Rastogi, S.C., 2006, Cell and Molecular Biology, New Age International Publishers, New Delhi.
7. Freifelder,D. 1990, Microbial Genetics. Narosa Publishing House , New Delhi.

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Hours per week -4 **Credit : 4**
Hours per Semester-60 **Subject code : U2MBC52**

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Understand the distribution and interactions of microbial population in soil and its role in biogeochemical cycles.
CO2: Evaluate the application of microbes in wastewater management.
CO3: Learn the beneficial application of microbes in agriculture.

Unit I **(12 hours)**

Distribution of microorganisms in soil – Factors influencing the soil microflora – Role of microorganisms in soil fertility – Interactions among microorganisms: mutualisms, commensalism, competition, amensalism, parasitism and predation – Positive interactions between microbes and plants: rhizosphere, phyllosphere and mycorrhizae.

Unit II **(12 hours)**

Biogeochemical cycles: Carbon cycle – Nitrogen cycle – Nitrogen fixation: symbiotic, asymbiotic and associative symbiotic relationships – Phosphorous cycle – Sulfur cycle.

Unit III **(12 hours)**

Microbes in waste treatment: Solid waste management: Saccharification, gasification and composting – Liquid wastes – Sewage treatment (Primary, secondary and tertiary treatments)

Microbial assessment of water – Most Probable Number (MPN) technique, membrane filtration – Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) – Biodegradation of xenobiotics (Chlorinated pesticide 2,4-D)

Unit IV **(12 hours)**

Microbes for sustainable agriculture - Rhizobium, Azotobacter and Blue-green algae – Mass production, field applications and significance of biofertilizers – Biopesticides – Bacterial: *Bacillus thuringiensis*, Viral: Nuclear polyhedrosis virus and Fungal: Trichoderma – Mode of action.

Unit V **(12 hours)**

Study of microbes as plant pathogens – Bacterial pathogens: Xanthomonas, Mycoplasma – Fungal pathogens: Cercospora, Fusarium – Viral pathogen: Tobacco Mosaic Virus, Cucumber Mosaic Virus.

Text books:

1. Subbarao, 1995, Soil microorganisms and plant growth, 4/e, Oxford and IBH, New York.
2. Ronald M. Atlas and Richard Bartha, 1997, Microbial Ecology, 4/e, Benjamin Cummings Publishing Company.
3. Ronald M. Atlas and Richard Bartha, 1997, Microbial Ecology, 4/e, Benjamin-Cummings Publishing Company.
4. Subbarao, 1995, Soil Microorganisms and Plant Growth, 4/e, Oxford and IBH, New York.
5. Mehrotra and Ashok Agarwal, 2005, Plant Pathology, 2/e, Tata McGraw-Hill Publishing Co. Ltd., Delhi.

References Books:

1. Michael T. Madigan *et. al*., 1997, Brocks's Biology of Microorganisms, 8/e, Prentice
2. Hall Internation Inc.
3. Ronald M. Atlas and Richard Bartha, 1997, Microbial Ecology, 4/e, Benjamin-Cummings Publishing Company.
4. Dubey and Maheshwari, 1999, A text book of Microbiology, 1/e, Chand publications, New Delhi.
5. Mehrotra and Ashok Agarwal, 2005, Plant Pathology, 2/e, Tata McGraw-Hill publishing Company Ltd., Delhi.
6. Subbarao, 1995, Soil Microorganisms and Plant Growth, 4/e, Oxford and IBH, New York.

MEDICAL MICROBIOLOGY

Contact hours per week: 4 **Credit : 4**
Contact hours per semester: 60 **Subject code : U2MBC53**

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Understand the mechanisms of pathogenesis and epidemiology of microbes.
CO2: Identify the causes and symptoms of various microbial infections.
CO3: Learn the therapeutic and preventive methods for microbial diseases.

Unit I **(12 hours)**

Characteristics of infectious diseases: Normal microbial population of human body: Skin, mouth, upper respiratory tract, intestinal tract, uro-genital tract and eye. Nosocomial infections – Transmission of pathogens: Air borne, Water borne, contact transmission and vector borne transmission.

Unit II **(12 hours)**

Mechanisms of pathogenesis: Entry of the microbes into the host: Mucus membranes, skin, parenteral route and adherence. Damage to host cells: Direct damage and toxins (exotoxins and endotoxins).

Unit III **(12 hours)**

General characteristics, pathogenesis, diagnosis, treatment and preventive measures of *E. coli, Staphylococcus aureus, Streptococcus pyogenes, Mycobacterium tuberculosis, Treponema pallidum* and *Salmonella typhi* infections.

Unit IV **(12 hours)**

Pathogenesis, diagnosis, treatment and preventive measures of HIV, Hepatitis B, Influenza virus and Polio infections. Pathogenesis, lab diagnosis, treatment and preventive measures of candidiasis.

Unit V **(12 hours)**

General characteristics, life cycle, diagnosis, treatment and preventive measures of *Entamoeba histolytica* and *Plasmodium falciparum* infections. Antimicrobial agents (inhibition of cell wall synthesis, inhibition of protein synthesis, damage to the plasma membrane and antimetabolites – sulfa drugs) and resistance mechanisms of bacteria to antimicrobial agents.

Textbooks:

1. Prescott, Harley and Klein, 2008, Microbiology, 6/e, McGraw-Hill.
2. Ananthanarayan and Paniker, 2013, Textbook of Microbiology, 9/e, University Press.

3. Tortora *et al*., 1982, Microbiology: An Introduction, 3/e, The Benjamin/Cummings Publishing Company, Inc, New York.
4. Ananthanarayan and Paniker, 2013, Textbook of Microbiology, 9/e, University Press.
5. Patric R. Murray, Ken S. Rosenthal, George S. Kobayashi and Michael A. Pfaller, 1998, Medical Microbiology, 3/e, Mosby, London.
6. Ananthanarayan and Paniker, 2013, Textbook of Microbiology, 9/e, University Press.

References:

1. Patric R. Murray, Ken S. Rosenthal, George S. Kobayashi and Michael A. Pfaller, 1998, Medical Microbiology, 3/e, Mosby, London.
2. Ananthanarayan and Paniker, 2013, Textbook of Microbiology, 9/e, University Press.
3. Prescott, Harley and Klein, 2008, Microbiology, 6/e, McGraw-Hill.
4. Jawetz, Melnic and Adelberg, 2004, Medical Microbiology, 22/e, McGraw-Hill.
5. Tortora *et al*., 1982, Microbiology: An Introduction, 3/e, The Benjamin/Cummings Publishing Company, Inc, New York.

MAJOR PRACTICAL V

LAB: ENVIRONMENTAL, AGRICULTURAL AND MEDICAL MICROBIOLOGY

Contact Hours per week: 6 **Credits : 3**
Contact Hours per Semester: 90 **Subject Code : U3MBC5P**

Course Outcomes:
Students, after successful completion of the course, will be able to

CO1: Get a platform that involves working knowledge of scientific research and academics, health clinics and industries.
CO2: know about microorganisms including their environmental, agricultural and medical microbiology
CO3: Learn about laboratory isolation and identification of microorganisms that will help them to understand the application of microbes in pharmaceutical industry, food and dairy microbiology and clinical microbiology.
CO4: Demonstrate an understanding and competency in laboratory safety and specialized microbiological laboratory skills including observation, creative and analytical thinking and data interpretation.

List of Experiments:

1. Isolation, identification and Enumeration of microorganisms from Urine, stool sputum, pus and throat samples.
2. Isolation and identification of fungi and bacteria from clinical specimens
3. Maintainence of cultures.
4. Isolation, Identification and Enumeration of microorganisms from soil.
5. Enumeration of microorganisms from water.
6. Microbiological analysis of water by Most Probable Number (MPN) technique.
7. Isolation of *Rhizobium sp* from root nodules.
8. Staining and observation of Mycorrhizae from infected roots.

9. Demonstration / observation of microalgae and diatoms.
10. Visit any industry and submit the report.

References:

1. Dubey, R.C. and O.K. Maheshwari, 2005, Practical Microbiology, 1/e, S. Chand & Co. Ltd., New Delhi.

2. Aneja, K.R. 2003, Experiments in Microbiology, Plant Pathology and Biotechnology, 4/e, New Age International, New Delhi.

3. Cappuccino and Sherman, 2007, Microbiology: A Laboratory Manual, 7/e, Pearson Education, New Delhi.

INTRODUCTION TO PHARMACOGNOSY

Contact Hours per semester: 60 **Credits : 4**
Contact hours per week: 4 **Subject code: U3MBA51**

Course outcomes:
Students, after successful completion of the course, will be able to
CO1: Develop the knowledge about drugs and their functions.
CO2: Improve the knowledge Conservation of medicinal plants.
CO3: Know about the functions various systems of medicine.

Unit I **(12 hours)**

Pharmacognosy-Introduction and History; Scope and development of Pharmacognosy; Sources of Drugs – Medicinal plants, marine sources and Tissue culture. Structural Classification of medicinal plants.

Unit II **(12 hours)**

Cultivation and Collection of drugs of natural origin; Factors influencing cultivation of medicinal plants; Conservation of medicinal plants; Applications of plant hormones: Auxin, Gibberlin, Cytokynin and Abcissic acid.

Unit III **(12 hours)**

Introduction and properties of primary metabolites: Carbohydrates- Beta-Glucose, Agar; Enzymes - Gelatinase, caseinase; Lipids- castor oil, bees wax. Introduction to secondary metabolites: Test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Essential oil and Resins.

Unit IV **(12 hours)**

Plant tissue culture: Historical development of plant tissue culture; Types of cultures; Nutritional requirements; growth and their maintenance. Applications of plant tissue culture in pharmacognosy.

Unit V **(12 hours)**

Applications of Pharmacognosy in various systems of traditional medicine: Allopathy; Ayurveda; Unani; Siddha; Homeopathy and Chinese systems of medicine.

Text Books:

1. Biren shah, 2013. Text book of Pharmacognocy and Phytochemistry, 2nd edition, Elsevier india.
2. Evans, W.C. 2009. Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co.,London,
3. Tyler, V.E., Brady, L.R. and Robbers, J.E., 1988. Pharmacognosy, 9th. edition, Lea and Febiger, Philadelphia,
4. Text Book of Pharmacognosy by T.E. Wallis, Published by Elsevier Inc.
5. Mohammad Ali., 2011. Pharmacognosy: Pharmacognosy and Phytochemistry, Volume 1, Published by CBS Publishers & Distributors Pvt. Ltd.
6. Kokate, C.K., Purohit, Gokhlae, 2007. Text book of Pharmacognosy, 37th edition, Nirali Prakashan, New Delhi.

References:

1. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, NewDelhi.
2. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, NewDelhi, 2007
3. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
4. Anatomy of Crude Drugs byM.A. Iyengar.
5. Cultivation of Medicinal and aromatic crops by A..A.Farooqui and B.S. Sreeramu.
6. Pharmacognosy & Pharmacobiotechnology by Ashutosh kar
7. Advances in Harticulture Volume.II Medicinal and Aromatic Plants by K.L. Chada & Rajendra Gupta.
8. Herbal Medicine expanded commission E Monographs. Blumenthal/ Goldberg/Brinckmam.
9. "Indian Medicinal Plants" Volumes by Kirtikar K.R. and Basu B.D.
10. Goodman and Gilman's Pharmacological Basis of Therapeutics.

MUSHROOM TECHNOLOGY

Contact Hours per week: 2 **Credits : 2**
Contact Hours per semester: 30 **Subject Code : U2MBS51**

Course outcomes:
Students, after successful completion of the course, will be able to

CO1: Understand the basic biology and life cycle of mushrooms.
CO2: Know the methodology of mushroom cultivation.
CO3: Know the commercial, therapeutic and nutritive value of mushrooms.

Unit I **(6 Hours)**

Mushroom technology – History and Scope – Morphology and classification – Edibility and poisonous properties – Formation and development of vegetative basidiocarp – Structure of basidiocarp.

Unit II **(6 Hours)**

Salient features of mushrooms – Morphology, Structure and Life cycles of Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajorcaju*), Paddy straw mushroom (*Volvariella volvcea*) and Button mushroom (*Agaricus bisporus*).

Unit III **(6 Hours)**

Mushrooms farm structure, design and layout – Isolation and culture of spores – Media preparation – Inoculation – Production of mother spawn – Multiplication of spawn – Principle and techniques of composting – Method of paddy straw mushroom cultivation – Casing – Cropping – Harvesting – Marketing.

Unit IV **(6 Hours)**

Nutritional value of mushrooms – Mushroom food products: organic mushroom – Mushroom nutraceuticals: *Ganoderma lucidium*, *Cordyceps sinensis* – Mushroom recipes: Sauteed mushroom, Stuffed mushroom and Grilled mushroom.

Unit V **(6 Hours)**

Therapeutic and Health benefits of mushrooms: Antimicrobial, anticancer metabolites from mushroom – Economic importance of mushrooms – Mushroom cultivation status in Tamilnadu.

Text Books:

1. V.N Pathak, Nagendra Yadav and Maneesha Gaur 2010, Mushroom production and processing Technology Published by Agrobios, India
2. Nita Bahl, 2002. Handbook of mushroom 4th edn. Vijay Primalani for Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Suman B. C. and Sharma V. P, 2014, Mushroom Cultivation in India, Daya Publishing House, New Delhi.
4. Hand Book of Mushroom Cultivation, 1999. TNAU Publications.
5. Dubey and Maheshwari. 2006. A Text Book of Microbiology. Chand Publications.
6. Chang T.S. and Hayes W.A., 1978. The Biology and Cultivation of Edible Mushrooms. Academic Press, New York.
7. Suman, B.C and Sharma V.P.2014, Daya Publishing House, New Delhi.
8. Ignacimuthu, S. 1997. Disease and Pests of Mushroom, Applied Plant Biotechnology, Oxford & IPH Publishing Co. Pvt. Ltd., New Delhi.

9. Dubey and Maheshwari. 2006. A Text Book of Microbiology. Chand Publications, New Delhi.
10. Tripathi, D. P., 2005, Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
11. Alice, D., Muthusamy and Yesuraja, M, 1999, Mushroom Culture. Agricultural College, Research Institute Publications, Madurai.

References:

1. V.N. Pathak, Nagendra Yadav and Maneesha Gaur 2010, Mushroom Production and Processing Technology Published by Agrobios, India
2. Suman B. C. and Sharma V. P, 2014, Mushroom Cultivation in India, Daya Publishing House, New Delhi.
3. Dubey and Maheshwari. 2006. A Text Book of Microbiology. Chand Publications. New Delhi.
4. ICAR publications, Cultivation of Edible Mushroom.

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**
Contact Hours per Semester: 30 **Credits: 2**

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : **(6 – Hours)**
Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock.

Unit II : **(6-hours)**
Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships.

Unit III: Reasoning **(6-hours)**
Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**
Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**
General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME - INTRODUCTION TO MICROBIOLOGY

Contact Hours per week: 2 **Credit: 2**
Contact Hours per Semester: 30 **Subject code: U3MBN51**

Course outcomes:
Students, after successful completion of the course, will be able to
CO1: Develop the basic awareness of microbiology
CO2: Understand the basic properties and importance of microorganisms

Unit I **(6 hours)**
Introduction to microbiology, concepts of microorganism –Theory of spontaneous generation, biogenesis and Germ theory of disease - History of microbiology: Leeuwenhoek, Louis Pasteur and Robert Koch.

Unit II **(6 hours)**
Bacteria: major features of bacteria – ultra structure of bacteria (*E. coli*) – shapes of bacteria (coccus, bacillus, vibrio and spirillum – introduction only) – Economic importance of bacteria - beneficial role of bacteria.

Unit III **(6 hours)**
Algae: definition and general features of algae – economic importance of algae – common algae: *Volvox* and *Spirulina.*

Unit IV **(6 hours)**
Fungi: Introduction and distinguishing characteristics – structure (yeast) – Economic importance of fungi.

Unit V **(6 hours)**
Protozoa: introduction and structure of *Plasmodium* – Virus: introduction and general characteristics of virus – Transmission and treatment of HIV.

Text books

1. Dubey, R.C. and Maheswari, D.K. 2010. A Text Book of Microbiology. S Chand publications, NewDelhi.
2. Mani , A., Selvaraj , A.M., Narayanan , L.M. and Arumugam, N. 2014. Microbiology – General and Applied . Saras Publication, Nagercoil, Tamil Nadu.

References

1. Prescott, Harley and Klein.2006.Microbiology 6/e. The McGraw-Hill companies.
2. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R.1993. Microbiology. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
3. Kumaresan, V. 2015. Biotechnology. Saras Publication, Nagercoil, Tamil Nadu.

4. Tauro, P., Kapoor, K.K. and Yadav, K.S.1989. An Introduction to Microbiology. Willey Publications. New Delhi.

RECOMBINANT DNA (rDNA) TECHNOLOGY

Hours per week : 4 **Credit : 4**
Hours per Semester : 60 **Subject code : U3MBC61**

Course outcomes:
Students, after successful completion of the course, will be able to
CO1: Gain knowledge about the various techniques used for gene transfer.
CO2: Understand the various enzymes and vectors involved in recombinant DNA technology.
CO3: Plan and undertake research in molecular biology in the laboratory.

Unit I **(12 hours)**
Enzymes: Restriction endonucleases (Type I, II and III) – DNA polymerase – Terminal nucleotidyl transferase – Alkaline phosphatase – Polynucleotide kinase – DNA ligase – Methyl transferases.

Unit II **(12 hours)**
Vectors (Plasmid vectors): pBR322 and pUC19 – Shuttle vectors – Bacteriophages vectors: M13 vector and lambda vector – Cosmids – Phagemids.

Unit III **(12 hours)**
Extraction and purification and estimation of nucleic acids – Gel electrophoresis – DNA sequencing: Maxam – Gilbert (Chemical) and Sanger – Nicholson (dideoxy/enzymatic) sequencing method.

Unit IV **(12 hours)**
Construction of Genomic library and cDNA library – Principle and applications in analysis of recombinants: Selection and screening of recombinants (Colony hybridization, Insertional inactivation and Blue and white colony selection) – Blotting techniques (Northern, Southern and Western) – Polymerase chain reaction (PCR).

Unit V **(12 hours)**
Applications of r-DNA technology: Medicine (Production of Insulin) – Recombinant vaccines – Gene therapy (Ex vivo and In vivo) – Transgenic animals (sheep) – Transgenic plant (Insect resistance). Biosafety of rDNA technology – Intellectual property rights (IPR) – Patenting of rDNA technology products.

Text books:

1. Brown .T.A, 2006, Gene Cloning and DNA Analysis– An Introduction, 5/e, Wiley-Blackwell, UK.

2. Dubey. R.C, 2013, A Textbook of Biotechnology, 5/e, S. Chand & Co. Ltd., New Delhi.

3. Primrose S. B. and Twyman R. M., 2006, Principles of Gene Manipulation and Genomics, 3/e, Blackwell Publishing Company, Oxford, UK.

4. Brown T. A. and Gene Cloning, 2006, DNA Analysis: An Introduction, 5/e, Wiley-Blackwell, UK.

5. Glick B.R. and Pasternak J. J., 2003, Molecular Biotechnology, 3/e, ASM press, Washington.

Reference Books:

1. Kumaresan, V., 2003, Biotechnology, 3/e, Saras Publication, Nagercoil, Tamil Nadu.
2. Joseph Sambrook and David William Russell, 2001, Molecular cloning, 3/e, CSHL Press, New York.
3. Brown .T.A, 2006, Gene Cloning and DNA Analysis – An Introduction, 5/e, Wiley-Blackwell, UK.
4. Dubey R.C., 2013, A Textbook of Biotechnology, 5/e, S. Chand & Co. Ltd, New Delhi.
5. Primrose S. B and Twyman R. M., 2006, Principles of Gene Manipulation and Genomics, 3/e Blackwell Publishing Company, Oxford, UK.
6. Glick B.R. and Pasternak J.J., 2003, Molecular Biotechnology, 3/e, ASM press, Washington.

FOOD AND INDUSTRIAL MICROBIOLOGY

Contact Hours per Semester: 60 **Credits : 4**
Contact Hours per week: 4 **Subject Code : U3MBC62**

Course outcomes:

Students, after successful completion of the course, will be able to
CO1: Develop knowledge about the role of microorganisms in food substances and detection of spoilage causing microorganisms.
CO2: Understand the basic ideas about the fermentation technology.
CO3: Know the various types of microbial production of industrial products.

Unit I **(10 hours)**

History of Food Microbiology, Food as a substrate for microorganisms, Factors affecting growth of Microorganisms: Intrinsic and extrinsic factors.

Unit II **(12 hours)**

Preservation of Food: High, Low Temperature, Radiation and Chemical preservatives. Food spoilage of Cereals, Meat, Milk and Milk products. Health – Promoting microorganisms – Probiotic bacteria.

Unit III **(12 hours)**

Microbial spoilage of foods & food borne diseases, food poisoning, food infection and intoxication. Examples: *E. coli* O157:H7, *Salmonella, Campylobacter jejuni, Bacillus cereus, Shigella sp., Clostridium sp., Staphylococcus sp. Aspergillus niger,* Norwalk like viruses, *Hepatitis A.*

Unit IV **(13 hours)**

Fermentor: Basic design and its function – Fermentor types: Air lift, Continuous Stirred Tank Reactor (CSTR), Tower and Packed bed fermentor. Fermentation types: Submerged and Solid state fermentation– Bioreactor operations – Batch, fed batch and continuous process: Media for industrial fermentation. Inoculum development, Strain improvement by rDNA technology.

Unit V **(13 hours)**

Industrially important of microbial products, Production of Penicillin, Streptomycin. Enzyme- amylase, protease and amino acid – Glutamic acid, ascorbic acids alcoholic beverage - wine production, Single Cell Protein (SCP) production and immobilization techniques. Biofuel, Biohydrogen and Methane production.

Text Books:

1. Frazier, W. C. and Westhoff, D.C., 1989, Food Microbiology, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Adams, M.R. and Moss, M.O., 2000, Food Microbiology, New Age International (P) Ltd., New Dehli.
3. Moshrafuddin Ahamed and Basumatary, S.K., 2008, Applied Microbiology, MJP Publishers, Chennai.
4. Patel, A.H., 2000, Industrial Microbiology, 1/e, Macmillan Publishers India.
5. Kalaichelvan, P.T. and Arulpandi., 2007, Bioprocess Technology, MJP Publishers, chennai.
6. Jebakumar Solomon, 2009, Foundations in Bioprocess Technology – Theory and Practice. Ratna Printers, TamilNadu.

Reference Books:

1. Peppler, H. J., 1979, Microbial Technology, Volumes I & II –. Academic Press, New York.

2. Stanbury, P. F. and Whitaker, A., 1984, Principles of Fermentation Technology – Pergamon Press.

3. Casida, L. E., 2007, Industrial Microbiology –Jr. John Wiley and Sons.

4. Patel, A. H. 2000, Industrial Microbiology, 1/e, Macmillan Publishers India.

RESEARCH METHODOLOGY AND BIOINFORMATICS

Contact Hours per week: 4 **Credit : 4**
Contact Hours per Semester: 60 **Subject Code: U3MBC63**
Course outcomes:
Students, after successful completion of the course, will be able to
CO1: Understand the principles of research and various research methods and their applications, principles of thesis writing.
CO2: Understand the basic Biostatistics and guidelines for writing a manuscript for a

journal.

CO3: Acquire knowledge in basic concept in bioinformatics.

CO4: Understand the various types of databases and uses and applications of biological databases.

Unit I **(10 hours)**

Introduction to Research –Literature Collection: review of Literature – Literature citation: citation sequence system – Journal Abbreviations – Research report: components – Plagiarism tools- iThenticate, Turnitin.

Unit II **(14 hours)**

Research report: tabulation –Figures: Numbering – Caption – Preparation of statistical diagram, Photographs, Microphotographs – Formatting and Typing: Spacing – Fonts – Format of thesis.

Unit III **(12 hours)**

Concepts in Statistics: Primary data and secondary data reports– Diagrammatic representation of Graphs and Diagram: Bar diagram, Pie diagram, Histogram. Experimental designs: Introduction – Observation – Hypothesis and Null-hypothesis – Experimental error – Replication – Controls.

Unit IV **(12 hours)**

Introduction to bioinformatics: Databases: Introduction - characteristics – types. Nucleotide databases: DNA Data Bank of Japan (DDBJ), National Center for Biotechnology Information (NCBI) – Protein Databases: Protein Data Bank (PDB), PRINTS.

Unit V **(12 hours)**

Searching and Sequencing analysis, Local Alignment (BLAST and FASTA) - Multiple sequence alignment: - Clustal W and Clustal X, Significance of MSA - Analysis of phylogeny and evolutionary trees. Phylogenetic software - Phylip.

Text Books

1. Research Methodology for Biological Sciences, N.Gurumani, (2006), MJP Publishers, Chennai.
2. Rastogi, S.C.*et al*., 2003, Bioinformatics- Concepts, Skills, and Applications. CBS Publishing.
3. S. Ignacimuthu, S.J., 1995, Basic Bioinformatics, Narosa Publishing House, New Delhi.

References

1. Leach, A. R., 2001, Molecular Modeling: Principles and Applications, Prentice Hall.
2. Gibas, C. and Jambeck. P, 2001, Developing Bioinformatics Computer Skills, Oreilly & Associates Inc.
3. Baxevanis, A. D. and B. F. Francis Ouellette, 2001, Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Wiley-IEEE.
4. N. Gautham, 2006, Bioinformatics: Databases and algorithms, Narosa publishing house, Chennai.
5. P. Shanmughavel., 2005, Principles of Bioinformatics, Pointer publishers, Jaipur.
6. Sharma, Munjal and Shankar, 2008, A text Book of Bioinformatics, Rastogi Publication, Meerut.

MAJOR PRACTICAL VI

LAB: Recombinant DNA Technology, Food and Industrial Microbiology

Contact Hours per week: 6 **Credit : 4**
Contact Hours per Semester: 90 **Subject Code : U3MBC6P**

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1: Provide theoretical as well as research-oriented training on food and industrial microbiology.

CO2: Provide public awareness regarding the merits and demerits of using microbes and microbial products in the fields of Recombinant DNA Technology, Food and Industrial production.

CO3: Apply scientific knowledge and high quality research in the field of rDNA Technology, Food and Industrial Microbiology.

CO4: Perform quality research focusing on Microbiology and other interdisciplinary fields.

List of Experiments:

1. Isolation of Plasmid DNA from bacteria and separation by Agarose gel electrophoresis.
2. Isolation of Chromosomal DNA from bacteria and separation by Agarose gel electrophoresis
3. Methylene blue reductase test – Milk Sample
4. Enumeration of bacteria in milk by standard plate count.
5. Enumeration of microorganisms from spoiled fruits (Orange/Apple) and spoiled vegetables(Tomato/potato)
6. Immobilization of yeast cells by sodium alginate.
7. Production of extracellular amylase enzyme by Submerged fermentation
8. Industrial visit and submit a report.

References:

1. J.G. Cappuccino and N. Sherman, 2014, Microbiology: A laboratory manual, 11/e, Pearson publications United States.
2. P. Gunasekaran, 1996, Microbiology: A laboratory manual, New Age international publishers, New Delhi.
3. N. Kannan, 2002, Laboratory manual in General Microbiology, Panima publishers, New Delhi.
4. Sundaraj, T. and S. Aswathy, 2002, Microbiology Laboratory Manual 1/e, Chennai.
5. Dubey, R.C. and O.K. Maheshwari, 2005, Practical Microbiology, 1/e, S. Chand and Co.Ltd., New Delhi.
6. Short protocols in Molecular Biology II edition, John Wiley & Sons by Fredrick M. Anusbel, Harvard Medical School.

BASICS CONCEPTS OF PHARMACOLOGY

Contact hours per week: 4 **Credits : 4**
Contact hours per semester: 60 **Subject Code : U3MBA61**

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Develop the knowledge of pharmacology.
CO2: Understand the anatomy and microbial infections of human.
CO3: Create the awareness about the adverse effects of drugs.

Unit I **(12 hours)**

Drugs- Introduction, Route of administration, Concept of Pharmacokinetics, Pharmaco-dynamics and Adverse drug reactions. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials.

Unit II **(12 hours)**

Measurement of Drug levels in different body fluids and significance. Drugs acting on digestive system- Antacids and drugs used in peptic ulcer, purgatives, and laxatives, Antidiarrohoeals, Emetics, Anti-emetics and Analgesics.

Unit III **(12 hours)**

Anti-Protozoan Drugs (Plasmodium falciparum & Entamoeba histolytica). Anti-Fungal Drugs (Aspergillus niger & Candida albicans). Anti-Bacterial Drugs (Salmonella typhi & Mycobacterium tuberculosis). Anti-Cancer Drugs. Anti-Viral drugs (HIV, Hepatitis B virus).

Unit IV **(12 hours)**

Antibiotics- Penicillin, Tetracyclines, Streptomycin, Sulphonamides. Antitubercular agents, Anti-leprotic drugs. Disinfectants and antiseptics.

Unit V **(12 hours)**

Drugs affecting the Gastro Intestinal System, Respiratory System, Cardiovascular System, Central nervous system, Urine and renal functions. Excretion of drugs in stool and bile.

Text books:

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J. 8th Edition 2015. Rang and Dale's Pharmacology,.Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J. 2012. Basic and clinical pharmacology, Tata McGrawHill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics, 2006. Page 81 of 161
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W. 2009. Applied Therapeutics, The Clinical use of Drugs, 9th edition, The Point Lippincott Williams &Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. 2014. Lippincott's Illustrated Reviews-Pharmacology, 6th edition, Wolters Kluwer(India) Pvt.Ltd - New Delhi.

References:

1. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers MedicalPublishers (P) Ltd, New Delhi.
2. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
3. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
4. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company,Kolkata.
5. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan.

ALLIED LAB: PHARMACOGNOSY AND PHARMACOLOGY

Contact hours per week: 2 **Credits : 2**
Contact hours per semester: 30 **Subject Code: U3MBA6P**

Course Outcomes:

Students, after successful completion of the course, will be able to

1. Learn and get experiences about herbs and their sciences
2. Define principle procedure of general formulations of drugs.
3. Recognize route of drug administration and classification of Pharmaceutical dosage form.

List of experiments:

1. Cross anatomical studies (T.S. of stem) of *Azadiracta indica* L.
2. Morphological characteristics of plant families- *Tridax procumbens* L., *Catharanthus roseus* (L.) G.Don
3. Maintenance of laboratory animals as per CPCSEA guidelines (record work only).
4. Blood collection, serum and plasma separation
5. Study of different routes of drugs administration in mice/rats (record work only)
6. Preliminary Phytochemical Screening of *Phyllanthus niruri* L.
7. Preliminary Phytochemical Screening of *Vitex negundo* L.
8. Preliminary Phytochemical Screening of *Pedalium murex* L.
9. Preliminary Phytochemical Screening of *Tribulus terrestris* L.
10. Preliminary Phytochemical Screening of *Moringa oleifera* Lam.

Recommended Books:

1. Bikash Medhi and Ajay Prakash, 2010. Practical Manual of Experimental and Clinical Pharmacology, jaypee brothers medical publishers (p) ltd.
2. Biswas.C and Johri, B.M.I999, The Gymnosperms. Narosa publishing house, New Delhi.
3. Harborne, J. B. practical manual of Phytochemical Methods (A Guide to Modern Techniques of Plant Analysis), Third Edition 1998. Published by chapman & Hall, an imprint of Thomson Science, 2-6 Boundary Row, London SE1 8HN, UK.

PROJECT WORK

Contact Hours per week: 2 **Credit : 2**

Contact Hours per Semester: 30 **Subject Code: U1MB6PR**

The aim of project work (lab work) is to inculcate students to learn adequate knowledge on research methodology in the subject and prepare them for pursuing research in experimental or computational areas of the subject. Student's allotment is done by lot system. The project work study is to be undertaken under the guidance of a Teacher of the Department. The guiding teacher will make continuous internal assessment of the Project Work. No teacher shall be permitted to guide more than eight students in a semester for Project Work under his/her supervision. The project work will be evaluated by the external examiner.

- Project will be done by the final year students in the sixth semester under the guidance of respective guides.
- For projects internal marks (max 40) will be awarded by the respective guide and external marks (max 60) will be awarded in the external examinations.
- Minimum number of pages for B.Sc. Project thesis shall be 30.

NME - APPLIED MICROBIOLOGY

Contact Hours per week: 2 **Credit: 2**
Contact Hours per Semester: 30 **Subject code: U4MBN61**

Course outcomes:
Students, after successful completion of the course, will be able to
CO1: Understand the basic ideas about beneficial role of microorganisms.
CO2: Learn the application of microbes in various field.
CO3: Develop the knowledge about the role of microorganisms on the food and dairy industry.

Unit I **(6 hours)**
Introduction to applied microbiology – microbes in agricultural improvement – role of microbes in food, medicine and industry.

Unit II **(6 hours)**
Agricultural microbiology: Biofertilizers – organism used as biofertilizer. Role of biofertilizer - Applications of Biofertilizer – *Rhizobium* (Symbiosis), Vermicompost.

Unit III **(6 hours)**
Food microbiology: microorganisms of food – common food items – purpose of microbial examination in foods – methods of food preservation: pickling, salting, canning and refrigeration (introduction only).

Unit IV **(6 hours)**
Dairy microbiology: composition of milk – role of microorganisms in milk – Dairy products: curd, yogurt and cheese.

Unit V **(6 hours)**

Medical microbiology: Normal microflora of Human body(skin infection) – Disease caused by microbes (interaction only)– Bacterial diseases – Cholera and Typhoid(causes, diagnosis, treatment and prevention).

Text books

1. Mani , A., Selvaraj , A.M., Narayanan , L.M. and Arumugam, N. 2014. Microbiology – General and Applied . Saras Publication, Nagercoil, Tamil Nadu.
2. Kumaresan, V. 2015. Biotechnology. Saras Publication, Nagercoil, Tamil Nadu.
3. Dubey, R.C. and Maheswari, D.K. 2010. A Text Book of Microbiology. S Chand publications, NewDelhi.
4. Ananthanarayanan, R. and Jayaram Panicker, C.K. 2005. Text book of Microbiology, orient Long man, London.

References

1. Swaminathan, M. 1990. Food and Nutrition, Bappco. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
2. Kannaiyan, S. 2002. Biotechnology of biofertilizers, Narosa publishing house, New Delhi.
3. Subba Rao, N.S. 2002. Soil microorganisms and plant growth. 4th edition. Oxford and IBH publishing co Pvt. Ltd, New Delhi.
4. Adams, M.R. and Moss, M.O. 2006.Food microbiology, New Age international (P) Ltd., New Delhi.
5. Greenwood, D. Richard C.B. Salk, John, F. and Peutherer. 2003. Medical Microbiology(5th Edition). Churchill Livingstone, USA.

Self-learning

Food Quality Analysis

CREDIT : 5 **SUBJECT CODE: U1MBSL51**

TOTAL MARKS: 100

Objectives:

To gain knowledge about the extrinsic and intrinsic parameters that affect food products.

Unit 1

Fundamentals of Food Microbiology – Types of Food sources - Food Contamination and spoilage

Unit 2

Foodborne Diseases and Beneficial Roles of Microorganisms

Unit 3

Analytical techniques in Microbiology - General techniques to diagnose food borne microorganisms.

Unit 4

Contamination, Preservation and Spoilage of Milk and Milk products- Quality testing of Milk: Dye reduction test.

Unit 5

Contamination, Preservation and Spoilage of Meat and Fish products.

References

1. Adams MR & Moss MO. Food Microbiology, New age international (P) Ltd publications, London
2. Frazier WC & Westhoff DC, Food Microbiology 5th edition, McGraw Hill publications, New York.

COURSE CONTENT AND SYLLABUS

Course Name: DBT (Diploma in Biotechnology)

Microbiology CHOICE BASED CREDIT SYSTEM

(For those who join in June 2020 and after)

DURATION: 1 YEAR **TOTAL MARKS: 100**

Eligibility (UG & PG)**:**

+2 in any branch of biological sciences with a minimum of 50% of marks are eligible for admission.

Medium of Instruction: English

Duration of the course: Two Semesters (One Year).

Hours of Instruction: One hour a day for five days from 3.40 PM to 4.40 PM

Attendance: Minimum 70% of attendance is required for attending the examination.

Maximum duration to complete the course: 1 Year

Total credits: 10 (5 credits / semester)

Course Scheme:

Semester	Part	Subject	Hours / Sem	Credit	Int+Ext= Total	Subject code
I	Core-1	Microbial Biotechnology	15	3	25+75=100	D20BT11
	Core-2	Nanobiotechnology	15	2	25+75=100	D20BT12
II	Core-3	Advanced Animal & Plant Biotechnology	15	3	25+75=100	D20BT 21
	Core-4	Fermentation Technology	15	2	25+75=100	D20BT 22
			60	**10**	**400**	

1. MICROBIAL BIOTECHNOLOGY

Hours per week -2 **Credit : 2**

Hours per Semester-15 **Subject code : D20BT11**

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Understand the fundamental microbial structure and functions of various physiological groups.

CO2 : Understand the architecture of viruses, their mode of action.

CO3 : Get clear idea about the applied microbiology.

UNIT I

Introduction to Microbial Technology. Microorganisms as factories for the production of novel compounds.

UNIT II

Biotechnological potentials of microalgae in food, feed and fuel. SCP Cultivation methods of *Spirulina.* Production of microbial biofertilizers –Azolla*, Rhizobium* BGA and VAM.

UNIT III

Microbial bioconversion of cellulosic and non-cellulosic wastes. Biopolymers and Bioplastics. Bioremediation of wood, fuels, lubricants, rubber, Plastics. Degradation of xenobiotics in environment: oil pollution, surfactants and pesticides

UNIT IV

Biological control of insects, bacterial-Bacillus throngenis, Pseudomonas, NPU, Trichoderma fungal and Viral diseases.

UNIT V

Primary and Secondary metabolic products

TEXT BOOKS

1. Bernad R. Glick and Jack J. Pasternak. Molecular Biotechnology Principles and Applications of Recombinant DNA. WCB, 2002

2. Glazer, A.N. and Nikaido, H. Microbial Biotechnology: Fundamentals of Applied Microbiology 2nd edn. Cambridge University Press, 2007.

3. R.C. Dubey. Text Book of Biotechnology. S. Chand & Co., New Delhi. 2008.

REFERENCE BOOKS

1. Prescott and Dunn. Industrial Microbiology. 4 th Ed, 1992

2. Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AM. Molecular Biology of the Gene. The Benjamin Cummings, 1987

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2. NANOBIOTECHNOLOGY

Hours per week -2 **Credit : 2**
Hours per Semester-15 **Subject code : D20BT12**

Course outcomes:
Students, after successful completion of the course, will be able to

CO1: Explain the fundamental principles of nanotechnology and their application to biomedical engineering
CO2 : Apply engineering and physics concepts to the nano-scale and non-continuum domain.

UNIT I

Overview of Nanobiotechnology - Opportunities and Promises of nanobiotechnology. Functional Principles of Nanobiotechnology- Structure and functional properties of Biomaterials, Molecular recognition and Flexibility of biomaterials, Bimolecular sensing.

UNIT II

Application in Biomedical and biological research, nano particles, viruses as nano-particles , nano chemicals and application., tumor targeting and other diagnostic applications.

UNIT III

Developing drug delivery tools through nano biotechnology, nano particle based immobilization assays, quantum dots technology and its application.

UNIT IV

Synthesis and characterization of different classes of biomedical polymers their uses in pharmaceutical, cardiovascular, ophthalmologic, orthopedic areas. Biosensors and nano biotechnology principles used in construction of microelectronic devices sensors and macro mechanical structures and their functioning.

UNIT V

Nanotechnology in Agriculture and Food technology - Insecticides development using nanotechnology and Nanofertilizers. Nanotechnology in food processing, food safety and biosecurity, toxin and contaminant detection, Smart packaging.

TEXT BOOKS

1. ChaChalla, S.S.R. Kumar, Josef Hormes, Carola Leuschaer, Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and Impactǁ, Wiley – VCH. 2005
2. D.S. Goodsell, Bionanotechnology: Lessons from Nature, Wiley Press 2004
3. C. M. Niemeyer and C. A. Mirkin- (Editor), Nanobiotechnology: Concepts, Applications and Perspectives, Wiley Press 2004

4. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center 2006
5. Neelina H. Malsch (Ed.),Biomedical Nanotechnology, CRC Press 2005
6. Mark A. Ratner and Daniel Ratner, Nanotechnology: A Gentle Introduction to the Next Big Idea, Pearson 2003
7. S. Klussman, The Aptamer Handbook: Functional Oligonucleotides and their Applications , Wiley- VCH Press
8. Nano Biotechnology by Balaji, Subbaih

REFERENCE BOOKS:

1. Nanobiotechnology- concepts, applications and perspectives, niemeyer, christofm. Mirkin, chad a., wiley publishers.
2. Nanobiotechnology of biomimetic membranes, martin, donald (edt), springer verlag publishers.

3. ADVANCED ANIMAL & PLANT BIOTECHNOLOGY

Hours per week -2 **Credit : 2**
Hours per Semester-15 **Subject code : D20BT21**
Course outcomes:
Students, after successful completion of the course, will be able to

CO1: Understand the background of concepts in animal cell culture.
CO2: Learn the processes involved in integrated insect pest management.
CO3: Gain a working knowledge in transgenic plants

UNIT I

Animal Cell culture –primary and established cell line cultures, functions of different constituents of culture mediums, serum and protein free media, Stem cells and their applications. Cryopreservation of gametes and embryos in mammals. *In-vitro f*ertilization, embryo splicing. Production of transgenic mammals.

UNIT II

Biotechnological approaches to vaccine production. Biotechnology in animal production-manipulation of wool growth in sheep and rabbits, Silk worm as a bioreactor. Ethical issues in animal biotechnology.

UNIT III

Plant tissue culture - Plant genome organization and gene structure and function and targeting of proteins to organelles, Tissue specific expression of storage protein genes, light-mediated genes and heat-shock protein genes.

UNIT IV

Transgenic plants Mobile elements – Autonomous and non-autonomous elements, organization and function of maize transposons. Ti plasmid of *Agrobacterium*, plant markers and promoters.

UNIT V

Application of transgenic plants for delaying of fruit ripening. Methods of gene transfer- Microinjection, Electroporation, Lipofection., shot gun methods. Phytoremidiation

TEXT BOOKS

1. Animal Biotechnology (1989): Comprehensive Biotechnology Frist Supplement: (Ed.) L.A. Babink and J.P.Phillips. Pregamon press, Oxford,

2. Plant Biochemistry and Molecular Biology, Lea, PJ, Leegood, RC, eds. John Wiley and Sons, Chichester and New York (1993).

REFERENCE BOOKS:

1. Future Developments in the Genetic Improvements of Animals. (1992): Ed. J.S.F.Barrer, K.Hammond and A.E.McClintock, Academic Press, NY.

2. Principles of Plant Biotechnology: An Introduction to Genetic Engineering in Plants. S.H. Mantell, JA Mathews, and RA. McKee. Blackwell, Oxford (1993).

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3. FERMENTATION TECHNOLOGY

Hours per week -2 **Credit : 2**
Hours per Semester-15 **Subject code : D20BT22**

Course outcomes:
Students, after successful completion of the course, will be able to

CO1: Develop an understanding of fermentation and inoculums media, their formulation and principles and techniques of sterilization.
CO2: Know the different types of fermentation processes and understand the biochemistry of various fermentations
CO3: Get clear idea about the separation techniques.

UNIT I

Airlift fermentors, stirred fermentors, packed glass bead reactor, anaerobic fermentors. BOD, COD.

UNIT II

Microbial growth kinetics, Monod model, Batch culture, Continuous culture, multistage system, fed-batch culture, applications of fed-batch culture, sterilization, medium formulation, rheology.

UNIT III

Microbial biomass, microbial enzymes, microbial metabolites, recombinant products, transformation processes,

UNIT IV

Probes for monitoring and control of fermentation, aeration and agitation.

UNIT V

Isolation, preservation and improvement of industrially important microbes. Filtration, centrifugation, two phase aqueous separation, chromatography, ultra filtration, reverse osmosis.

TEXT BOOKS

1. Principles of fermentation technology P F Stanbury, A Whitaker, S J Hall, Pergamon Press 2007.

2. Biochemical engineering fundamentals, J E Bailey, D F Ollis, McGraw-Hill (2006)

REFERENCE

1. Bioprocess Engineering by M Shuler and F Kargi (2002) Prentice Hall (I) Ltd, N Delhi.

COURSE CONTENT AND SYLLABUS

Course Name: DHI (Diploma in Health Inspector course)

Microbiology CHOICE BASED CREDIT SYSTEM

(For those who join in June 2020 and after)

DURATION: 1 YEAR **TOTAL MARKS: 100**

Eligibility (UG & PG**):**

+2 in any branch of biological sciences with a minimum of 50% of marks are eligible for admission.

Medium of Instruction: English

Duration of the course: Two Semesters (One Year).

Hours of Instruction: One hour a day for five days from 3.40 PM to 5.40 PM

Attendance: Minimum 70% of attendance is required for attending the examination.

Maximum duration to complete the course: 1 Year

Total credits: 20

Course Scheme:

Semester	Part	Subject	Hours / Sem	Credit	Int+Ext= Total	Subject code
I	Core-1	Human Anatomy and Physiology	15	3	25+75=100	D20HI11
	Core-2	Environmental Sanitation	15	3	25+75=100	D20HI12
	Core-3	Public Health Administration	15	3	25+75=100	D20HI13
II	Core-4	Care in Disaster Management & First Aid Services	15	3	25+75=100	D20HI21
	Core-5	Food & Nutrition, Maternal & Child Health	15	3	25+75=100	D20HI22
		Supervised Field Training (SFT)		5		D20HI2T
			75	**20**	**500**	

1. HUMAN ANATOMY AND PHYSIOLOGY

Hours per week -2 **Credit : 3**
Hours per Semester-15 **Subject code : D20HI11**

Course Outcomes:
Students, after successful completion of the course, will be able to

CO1: Explain the structure and Functions of various systems of human body.
CO2: Describe structure and function of Digestive, Skeletal, Muscular, Nervous, Respiratory, Cardiac, Excretory and Reproductive systems

Unit: I
Introduction on Bones of the Human: Body-Upper Limb: clavicle, scapula, humerus, Lower Limb: hipbone, femur, tibia, fibula, Skull: Structure, Thorax: ribs, Vertebral Column: Cervical, thoracic, cocasial vertebrae.

Unit: II
Muscles: abdomen, Respiratory Organs: Lungs, Circulatory Organs: heart, Pericardium of the heart, Valves of the heart.

Unit: III

Digestive Organs: Tongue, Teeth, Oral cavity, Pharynx, Oesophagus, Stomach, Small intestine, Large intestine and its colons,

Unit: IV

Reproductive Organs- Male & Female Gonads: Testes, Epididymis, Ovary, Fallopian Tube, Uterus, Vagina.

Unit: V

Liver and Spleen: Introduction, Anatomical Position, Gal bladder. Excretory Organs & Secretary Organs- Kidney, Ureter, Urinary Bladder, Urethra (male and female).

TEXT BOOKS

1. Solomon. E.A., (2008) Introduction to Human Anatomy and Physiology 3rd Ed, Saunders: St Louis.
2. Chaursia, B.D., & Garg, K., (2012) Human Anatomy Regional and Applied. CBS Publications: New Delhi
3. T.S. Ranganathan – A text book of Human Anatomy

4. Fattana, Human anatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore – 1991

REFERENCE BOOKS:

1, Anatomy and Physiology for Nurses - Evelyn & Bearce
2. Hand book of Human Physiology - Vidyaradan
3. Anatomy and Physiology - Ross and Wilson
4. First Aid - L.G.Gupta & A.Gupta
5. Anatomy and Physiology and Health Education- N.Murugesan

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2. ENVIRONMENTAL SANITATION

Hours per week -2 **Credit : 2**
Hours per Semester-15 **Subject code : D20HI12**

Course Outcomes:

Students, after successful completion of the course, will be able to
CO1: Provide potable and safe water supply
CO2: Understand man's physical environmental factors in relation to health and sanitation
CO3: Keep the villages and cities filth free and clean.
CO4: Motivate the people for safe disposal of excreta
CO5: Ensure Safe disposal of solid waste and dead

UNIT-I

Scope of environmental sanitation. Relationship of environmental sanitation and health and its importance. Water and Health-Sources of water and characteristics. Protected water supply. Chlorination.

UNIT-II

Introduction to school sanitation – Objectives – need and importance of school sanitation Rashtriya Bal Swasthya Karyakram (RBSK) comprehensive school health programme –role of HI in school sanitation Essentials components of sanitation in schools.

UNIT-III

Public health aspects of Human excreta disposal. Requirements of a sanitary latrine-selection of site for latrines. Public and house hold latrines-decomposition of excreta. Types of latrines and construction features- Travel of pollution from latrine pits. Bio Toilet.

UNIT- IV

Norms for waste generations – Characteristics of Municipal Solid Wastes [Physical and Chemical] Solid Waste Management systems. Municipal Solid Waste Disposal: Public –Private – Partnership [PPP].

UNIT- V

Bio Medical Waste Management (Handling and Management) - Sources, types and different categories of Bio Medical Waste. Swachh Bharat Abhiyan Clean India, - Rural Sanitary Mart.

TEXT BOOK

1. Preventive and Social Medicine by J.E Park and K.Park.
2. Municipal and Rural Sanitation by Ehlers and Steel.
3. Public Health Engineering by GS Bajwa.
4. Waste water engineering, treatment and reuse by Metcalf and Eddy,5 th Edition,Tata Mc graw hill
5. Environmental sanitation –Ehlers, V.M., add steel,E.W.,McGraw-Hill Book Co

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3. PUBLIC HEALTH ADMINISTRATION

Hours per week -2 **Credit : 2**
Hours per Semester-15 **Subject code : D20HI13**

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1: Explain Public Health administrative set up in Centre- State-District-Block- PHC-village levels
CO2: Discuss the importance of management at different levels
CO3: Play the role of supervisor and birth & death registrar
CO4: Discuss the role and responsibilities of HI/SI working at different levels
CO5: Describe Public Health Laws to be executed at various levels
CO6: Maintain records and reports related to their job function

UNIT I

Historical development of public health - Changing concepts of public health. Various committees on health development in India. Health care delivery system-

UNIT II

Public Health set up at National -State level-organization-functions, Public Health set up at District-Block-Sector -Village level-organization-function- Job responsibilities of HI/SI in ULBs and PHCs, Primary Health Care-Definition-components-principles, Recent trends in Health care delivery systems.

UNIT III

Introduction to Management-POSDCORB-Administration, Programme planning- steps- evaluation of health programmes, Supervision-qualities of a supervisor, Team work- importance, Records – reports- Need and importance-report submission, PPP-Public Private Partnership in Health care— importance,

UNIT IV

Power of Entry / Inspection / Investigation [examination] Procedures. Nature of Inspection and frequency of Inspection. Preparation of notices / service of notices- Power of arrest- Compounding of offences- Appeal Procedures- Cognizance of offence – Criminal Proceeding procedures. Filing of Charge Sheets in the court and attending Proceedings.

UNIT V

HMIS- Components-Uses- Importance – Application of computer programmes. Sources of health information -Census-Registration of Vital events- Health surveys- National Family Health Survey (NFHS) - District Level Health Survey (DLHS). Health Statistics.

Field visits

1. Visit to CHC, PHC, HSC to identify the organization structure and functions
2. Visit to Urban Health facilities to identify the organization structure and functions
3. Visit to CHC/PHC/HSC to discuss the Job responsibilities of HI/SI in a public health set up in PHC/ Municipalities/ Town Panchayats and records to be maintained by HI/SI

References:

1. An Introduction to Public Health, Harry S. Mustard, The Macmillan Co., New, York, 1960
2. Preventive & Social Medicine,Park & Park, Bhanarsidas Bharot Publish,Jabalpur21 Edn
3. Teaching Health Statistics, S.K.Lwanga & CHO Yook tye, WHO, Geneva,1986
4. Organizational Behavior (9th edition), Hellnegel, Slocum & Woodman, South Western College Publications, US
5. Health System Support for Primary, Bogdon M.Kleczkow Ski et al, WHO, Geneva, Health care 1984.
6. A Short Book of Public Health V. K. Muthu, JAPEE Brother Medical Pub. (P) Ltd. New Delhi, 2005.

4. FIRST AID SERVICES AND EMERGENCY CARE IN DISASTER MANAGEMENT

Hours per week -2 **Credit : 2**
Hours per Semester-15 **Subject code : D20HI21**

Course Outcomes:
Students, after successful completion of the course, will be able to
CO1: Explain the need and importance of disaster management
CO2: Identify the Disaster Management Agency in the community
CO3: Mobilize the community in disaster management
CO4: Explain the objectives of First aid care and provide the first aid care for the injured

Unit: I
First aid care: Introduction- objectives – limitations – principles – golden rules. Casualty Management: Introduction – Handling and Transport – Loading a stretcher – Blanket lift – Manual lift- carrying a stretcher – Ambulance - loading and unloading**.**

Unit: II
Injuries to Bone, Joints and Fractures: Causes– sign and symptoms – first aid- Road accidents – wounds and bleeding – Hemorrhage – Bleeding from nose, stomach, lung, gum, bowel, ear and kidney.

Unit: III
Cardiac Emergency: Introduction – Cardio pulmonary arrest – Cardio pulmonary resuscitation – CPR for small children and infants.

Unit: IV
Poisoning: Introduction – classification – management of poisoning – bites and stings – snake bites – dog bites – insect bites and stings – stings of bees, rasps, fleas and hornets – Household poisons – specific poisons – drug poison – plant poison – Alcohol poison – Industrial poisons – Antidotes.

Unit: V
Introduction to Disasters**,** – Classification of the disasters – Flood – Drought – Cyclone – Hurricane – Earth quake – Volcanic eruption, Fire.

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5. FOOD, NUTRITION, MATERNAL AND CHILD HEALTH

Hours per week -2 **Credit: 2**
Hours per Semester-15 **Subject code: D20HI22**

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1: Define proximate principles of food

CO2:Explain the importance of nutritional assessment survey in a community and identify the nutritional status of the community

CO3: Discuss the methods of Prevention of Food Adulterations and explain the components of MCH care

CO4: Explain the importance of school health programme in India and describe the contraceptive methods

CO5: Explain the contra indications and limitation of various contraceptive methods

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Unit I

Definitions of common terms in Nutrition, Changing concepts, Relation of Nutrition to Health, Functions of food, Constituents of Food, Classification of foods, Nutrients.

Unit II

Nutritive value of Foodstuffs: Cereals and millets, Pulses and nuts, Vegetables, Fruits, condiments and spices, Beverages. Nutritional Requirements – Recommended daily allowance (RDA).

Unit III

Nutritional needs during pregnancy, common disorders and infection of pregnancy (Anemia, HIV infection, Pregnancy induced hypertension), relationship between maternal diet and birth outcome.

Unit IV

Nutritional needs of nursing mothers and infants, determinants of birth weight and consequences of low birth weight, Breast feeding biology, Breast feeding support and counseling.

Unit V

Infant and young child feeding and care - Current feeding practices and nutritional concerns, guidelines for infant and young child feeding, Breast feeding, weaning and complementary feeding Vaccination, Immunization schedule.

Field Visit

1. To CHC,PHC, HSC to observe various programmes related to RCH and FWP
2. Visit to PPC
3. To Anganwadi centre to observe the growth monitoring charts
4. To Noon meal centre to observe nutritional status and feeding of children

TEXT BOOK

Wadhwa A and Sharma S (2003). Nutrition in the Community-A Textbook. Elite Publishing House Pvt. Ltd. New Delhi.

Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s Banarasidas Bhanot Publishers, Jabalpur, India.

Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi. SEC

REFERENCE BOOKS:

1. Essentials of Community Health Nursing, K.Park, 6th Edition, M.s Banarsidas Bhanot Publications.
2. Preventive & Social Medicine, Park & Park, Bhanarsidas Bharot Publish, Jabalpur.
3. Food & Nutrition Vol.1, M.Swaminathan,1984.
4. Principles of Nutrition & Diets, M.Swaminathan, BAPPCO, Bangalore,1995
5. Health & Nutritional Status in India,G.Kamalamma, APH Publishing Corporation, Delhi,1996.

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6. SUPERVISED FIELD TRAINING (SFT)

Credits: 2 **Subject code: D20HI2T**

Supervised Field Training is a field placement programme of UG/PG students for Two week in Corporation/ Railways/ Municipality/ Town Panchayat. It is organized and carried out in a real work situation, where students are assigned field work under the supervision of the host agency.

Credits: 2 **Concurrent Field Training**

Collection of general information and Introduction with local leaders
Village / Ward mapping
Household Survey
Study of vital statistics Registration
Well survey, water sample collection and chlorination
Identification of leaders
Analysing of data and Preparation of report and Presentation
Detailed House Survey
School Sanitation Survey
Inspection of Dangerous and offence trades
Hotel
Lodging House

Cinema Theatre/Community Halls/ Marriage Halls/ shopping malls
Market
Barbershop
Bakery
Aerated water factory/Water plants
Rice mill
Dhobikhana
Collection Food sampling technique
To visit Regional Food Laboratory
Slaughter House
To observe cold chain maintenance at CHC , PHC, HSC
To visit malaria clinic programme, District Entomology Microbiology Lab to observe Vector & Fly control programmes.
To visit isolation ward in Govt. Hospitals
To visit ICTC, VCT Centers in NACP
To visit the District TB centers
Drinking water treatment plants
Water quality monitoring unit
Zero waste excreta disposals / Eco – friendly Bio Toilet
Solid waste management at different levels
Bio medical waste management
Sewerage Treatment Plant
To conduct Group discussion, Demonstration and interview technique on given health and sanitation topic
To apply PLA techniques in a community
Visit to community/ICDS centre/ primary school for health and hygiene education
To Lodging House to observe sanitation facilities - Ventilation- Lighting
To Food Establishments to observe sanitation facilities
To Slaughter House to observe sanitation facilities -Markets (Vegetable, Mutton, Fish) - Bakery, Aerated Water factory
To Dairy plants to observe Pasteurization

Program Name: BACHELOR OF COMPUTER APPLICATIONS
Discipline : COMPUTER APPLICATIONS
(For those who Join in 2018 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
V	Core11	Operating System	4	4	25+75=100	U3CAC51	Employability	40% Change Migrated from previous semester
	Core12	Data Communications and Networks	4	4	25+75=100	U1CAC52	Employability	No Change Migrated from previous semester
	Core13	Mobile Application Development	4	4	25+75=100	U1CAC53	Skill Development	New
	Elective 1	Web Technology / Data Mining / TCP/IP	5	5	25+75=100	U3CAE51	Skill Development	40% Change
						U3CAE52	Employability	35% Change
						U3CAE53	Employability	25% Change
	SBE-5	Employability Skills	2	2	25+75=100	U1PS51	Employability	No Change
	NME-1	Basics of Computer	2	2	25+75=100	U3CAN51	Employability	New
	Core 14 –Lab	LAB : Mobile Application Development	5	3	40+60=100	U3CAC5P1	Skill Development	New
	Core 15 –Lab	LAB : Web Technology	4	2	40+60=100	U3CAC5P2	Skill Development	30% Change
Semester	**Part**	**Subject**	**Hour**	**Credit**	**Int+Ext= Total**	**Subject Code**	**Focus on Employability/ Entrepreneurship/ Skill Development**	**Revised/ New/ No Change/ Interchanged If Revised % of Change**
VI	Core16	Software Engineering	4	3	25+75=100	U2CAC61	Employability	No Change
	Core 17	Cryptography	4	3	25+75=100	U3CAC62	Employability	10% Change
	Elective 2	Embedded Systems / Computer Algorithms / Cloud Computing	5	5	25+75=100	U2CAE61/ U2CAE62/ U2CAE63	Employability/ Employability/ Skill Development	No Change Migrated from previous semester
	SBE-6	Internet of Things	2	2	25+75=100	U3CAS61	Employability	New
	NME-2	Introduction to Multimedia	2	2	25+75=100	U3CAN61	Skill Development	20% Change
	Project and Viva Voce	Project and Viva Voce	5	5	50+50=100	U1CA6PR	Employability	No Change
	Core 18 –Lab	LAB : Dot Net Programming	5	3	40+60=100	U3CAC6P1	Skill Development	30% Change

	Core 19 – Lab	LAB : Multimedia	3	2	40+60=100	U3CAC6P2	Employability	10% Change

Self-Learning Courses:

Subject	Credit	Ext =Tot	Subject Code
UNIX and Shell Programming	5	100 = 100	U1CASL51
System Software	5	100 = 100	U1CASL52

Core 11: Operating System

Contact Hours per Week : 4 Hours **Subject Code: U3CAC51**
Contact Hours per Semester: 48 Hours **Credits: 4**

Course outcome:
Students, after successful completion of the course ,will be able to

CO1: Learn the different types of operating systems and I/O Structure.
CO2: Learn the process scheduling in the system, how processes communicate with each other.
CO3: Learn the synchronization between the processes, when deadlock will happen, how to prevent and recover from deadlock.
CO4: Learn memory management schemes and virtual memory concepts in the system.
CO5: Learn different ways of directory implementation and allocation methods in operating system.

Unit I **10 Hours**

Introduction: What Operating Systems Do - Computer-System Organization – Computer-System Architecture – Operating-System Structure – Operating-System Operations – Process Management – Memory Management – Storage Management – Computing Environments.

Unit II **10 Hours**

System Structures: Operating-System Services – User Operating-System Interface – System Calls – Types of System Calls – System Programs.
Process Concept: Process Concept - Process Scheduling - Inter Process Communication.
Process Scheduling: Scheduling Criteria – Scheduling Algorithms.

Unit III **10 Hours**

Synchronization: The Critical Section Problem – Peterson's Solution – Monitors.
Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

Unit IV **9 Hours**

Memory-Management Strategies: Background – Contiguous Memory allocation – Paging – Structure of the Page Table – Segmentation.
Virtual-Memory Management: Background – Demand Paging - Page Replacement.

Unit V **9 Hours**

Implementing File Systems: Directory Implementation - Allocation Methods - Free Space Management - Recovery.

Secondary-Storage Structure: Disk Structure – Disk Attachment – Disk Scheduling – Disk Management – RAID Structure.

Text Book:

Abraham Silberschatz, Peter B.Galvin, Greg Gagne, ***Operating System Concepts,*** Wiley India Pvt Ltd., 8th Edition, 2015.

Unit I : Chapter 1.1 – 1.8, 1.12
Unit II : Chapter 2.1 – 2.5,
Chapter 3.1, 3.2, 3.4,
Chapter 5.2, 5.3
Unit III : Chapter 6.2, 6.3, 6.7
Chapter 7.1 – 7.7
Unit IV : Chapter 8.1, 8.3 – 8.6
Chapter 9.1, 9.2, 9.4
Unit V : Chapter 11.3 – 11.5, 11.7
Chapter 12.2 – 12.5, 12.7

Reference Books:

1. Milan Milenkovic, ***Operating System Concepts and Design***, Tata McGraw- Hill Private Limited, New York., 2007.
2. Achyut Godbole, ***Operating Systems***, Tata McGrawHill Education Private Limited, New Delhi, 2009.

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Core12 - Data Communications and Networks

Contact Hours per Week : 4 Hours **Subject Code: U1CAC52**
Contact Hours per Semester: 48 Hours **Credits : 4**

Course Outcome:

Students, after successful completion of the course ,will be able to

CO 1: Describe how computer networks are organized with the concept of layered approach.
CO 2: To contrast the protocol architectures such as OSI and TCP/IP.
CO 3: To explain how a collision occurs and how to solve it.
CO 4: Identify the different types of network devices and their functions within a network
CO 5: Describe how routing protocols work.
CO 6: Define information security and to identify the challenges for information security

Unit I **10Hours**

Introduction: A Brief History – Applications – Computer Networks – Categories of Networks –Standards and Standards Organizations.

Network Architectures and OSI Model: Networks Architecture-Open Systems and OSI Model – TCP/IP Architecture.

Communication Media and Data Transmission: Fourier Analysis – Analog and Digital Data Transmission – Modulation and Demodulation – Transmission Media – Wireless

Communications – Data Transmission Basics – Transmission Mode – Interfacing – Multiplexing

Unit II **10 Hours**

Error Detection and Correction: Types of Errors – Error Detection – Error Correction.
Data Link Control and Protocol Concepts: Flow Control – Error Control –Asynchronous Protocols – Synchronous Protocols – High-Level Data Link Control (HDLC).
Local Area Networks: Types of Networks and Topology –LAN Transmission Equipment-.Ethernet: IEEE Standard 802.3 Token Bus: IEEE Standard 802.4 Token Ring:IEEE Standard 802.5 – Fiber Distributed Data Interface (FDDI) – Distributed Queue Dual Bus (DQDB): IEEE Standard 802.6 –Ethernet Technologies

Unit III **10 Hours**

Wide Area Networks: WAN Transmission Methods – WAN Carrier Types – WAN Transmission Equipment-WAN Protocols
Integrated Services and Routing Protocols: Integrating Services – ISDN Services –ISDN Topology – ISDN Protocols – Broadband ISDN – Asynchronous Transfer Mode (ATM) – Principal Characteristics of ATM – Frame Relay..

Unit IV **9 Hours**

Internetworking: Principles of Internet Working – Routing Principles – Internetwork Protocols (IP) – Shortcomings of IPv4 – IP Next Generation.
TCP Reliable Transport Service: Transport Protocols – The Service TCP Provides to Applications – End –to-End Service and Datagrams – Transmission Control Protocol – User Datagram Protocol.

Unit V **9 Hours**

Network Applications: Client-Server Model – Domain Name System (DNS) – Telnet – File Transfer and Remote File access – Electronic Mail – World Wide Web (WWW).
Network Management: Simple Network Management Protocol (SNMP).
Network Security: Fundamental Concepts – Identification and Authentication–Access Control–A Model for Network Security-Malicious Software.

Text Book:

Brijendra Singh. ***Data Communications and Computer Networks.*** PHI; Fourth Edition, 2014.

Unit I : Chapter – 1(1.1 to 1.4, 1.8), 2(2.1 to 2.3), 3(3.2 to 3.9, 3.11).
Unit II : Chapter – 4,6, 7 (7.1 to 7.7,7.10)
Unit III : Chapter – 8 (8.1 to 8.5), 9(9.1 to 9.8)
Unit IV : Chapter – 12(12.1,12.3,12.5 to12.7),13(13.2 to 13.6)
Unit V : Chapter – 14,15 (15.5), 16(16.1 to 16.5)

Reference Books:

1. Andrew S Tanenbaum.***Computer Networks***. Prentice Hall of India; 4th Edition.2006.
2. Prakash C. Gupta.***Data Communications and Computer Networks***. Prentice Hall of India;2005.
3. Behrouz A. Forouzan. ***Data Communication and Networking***. TMH; 2005.

Core 13: Mobile Application Development

Contact Hours per Week : 4 Hours **Subject Code: U1CAC53**
Contact Hours per Semester: 48 Hours **Credits: 4**

Course outcome:
Students, after successful completion of the course, will be able to

CO1: Understand the Architecture, Devices and Applications of Android.
CO2: Understand the Android Activity Life Cycle and User Interface.
CO3: Develop Interactive android Applications using Concepts such as Intents and Fragments.
CO4: Develop android applications to manage user data using Databases, File Storage and Preferences.
CO5: Able to Export an Application to Android Play store and reach globally.

Unit I **10 Hours**

Getting started with Android programming: What is Android? – Obtaining the Required Tools – Creating your First Android Application – Anatomy an Android Application. **Designing your user interface with views:** Using basic views – Using Picker views – Using List views to display long lists.

Unit II **10 Hours**

Activities, Fragments and intents: Understanding Activities – Linking Activities using intents – Fragments – Calling Built-in Applications using intents. – Displaying notifications.

Unit III **10 Hours**

Getting to know the Android user interface: Understanding the Components of a screen – utilizing the action bar – creating the user interface programmatically – listening for UI notifications.
Data Persistence: Saving and Loading user preferences – Persisting Data to Files.

Unit IV **9 Hours**

Displaying Pictures and Menus with Views: Using Image Views to Display Pictures – Using Menus with Views – Some Additional Views.
Messaging: SMS Messaging – Sending E-mail.

Unit V **9 Hours**

Location Based Services: Displaying Maps – Getting Location Data – Monitoring a Location – Project: Building a Location Tracker.
Publishing Android Applications: Preparing for publications – Deploying APK Files.

Text Book:

Wei-Meng-Lee, ***Beginning Android 4 Application Development***, Wiley India Edition, 2017

Unit I : Chapter 1, 4 (Page No: 159-201)
Unit II : Chapter 2
Unit III : Chapter 3 (Page No: 105-122), 6 (Page No: 251-271)
Unit IV : Chapter 5, 8
Unit V : Chapter 9,12

Reference Book:

Pradeep Kothari, ***Android Application Development***, Dreamtech Press, 2017.

Elective 1: Web Technology

Contact Hours per Week : 5 Hours **Subject Code: U2CAE51**
Contact Hours per Semester: 60 Hours **Credits: 5**

Course outcome:

Students, after successful completion of the course ,will be able to

CO1: List the major elements of the PHP & MySQL work and explain why PHP is good for web development
CO2: Learn how to take a static website and turn it into a dynamic website run from a database using PHP and MySQL.
CO3: Analyze the basic structure of a PHP web application and be able to install and maintain the web server, compile, and run a simple web application.
CO4: Learn how databases work and how to design one, as well as how to use phpMyAdmin to work with MySQL.
CO5: Learn different ways of connecting to MySQL through PHP, and how to create tables,enter data, select data, change data, and delete data. Connect to SQL Server and other data sources.

Unit I **12 Hours**

Introduction to PHP: Basic Syntax – Sending Data to the Web Browser – Writing Comments – What are Variables? – Introducing Strings – Concatenating Strings – Introducing Numbers – Introducing Constants – Single vs. Double Quotation Marks. **Programming with PHP:** Creating an HTML Form – Handling an HTML Form – Conditionals and Operators – Validating Form Data.

Unit II **12 Hours**

Programming with PHP: Introducing Arrays – For and While Loops.
Creating Dynamic Web Sites: Including Multiple Files – Handling HTML Forms, Revisited – Making Sticky Forms – Creating Your Own Functions.

Unit III **12 Hours**

Introduction to MySQL: Naming Database Elements – Choosing Your Column Types – Choosing Other Column Properties – Accessing MySQL.

Introduction to SQL: Creating Databases and Tables – Inserting Records – Selecting Data – Using Conditionals – Using LIKE and NOT LIKE – Sorting Query Results – Limiting Query Results – Updating Data – Deleting Data – Using Functions.

Unit IV **12 Hours**

Using PHP with MySQL: Modifying the Template – Connecting to MySQL – Executing Simple Queries – Retrieving Query Results – Ensuring Secure SQL – Counting Returned Records – Updating Records with PHP.

Cookies and Sessions: Making a Login Page – Making the Login Functions – Using Cookies – Using Sessions – Improving Session Security.

Unit V **12 Hours**

Web Application Development: Sending E-Mail – Date and Time Functions – Handling File Uploads – PHP and JavaScript – Understanding HTTP Headers.

Text Book:

Larry Ullman, ***PHP 6 AND MySQL 5***, Pearson Education, 2008.

Unit I : Chapter 1, 2 (Page No: 33-51)
Unit II : Chapter 2 (Page No: 52-72), 3
Unit III : Chapter 4, 5
Unit IV : Chapter 8, 11
Unit V : Chapter 10

Reference Book:

Timothy Boronczyk, Elizabeth Naramore, Jason Gerner, Yann Le Scouranec, Jeremy Stolz, Michael K.Glass, ***Beginning PHP6, Apache, MySQL Web Development***, Wiley Publishing, 2016.

Elective 1: Data Mining

Contact Hours per Week: 5 Hours **Subject Code: U3CAE52**
Contact Hours per Semester: 60 Hours **Credits: 5**

Course Outcome:

Students, after successful completion of the course ,will be able to

CO1: To be familiar concepts of Data Mining and Warehousing and its operations.
CO2: To get exposed with Association rules in Data Mining.
CO3: To get exposed with Clustering techniques and Decision Trees in Data Mining.
CO4: To get familiar with Genetic Algorithm and Neural Network.
CO5: To get exposed with Web, Temporal and Spatial Mining.

Unit I **12 Hours**

Data Warehousing: Introduction – Data Warehouse Architecture – Dimensional Modeling – Categorization of Hierarchies – Aggregate Function – OLAP Operations – OLAP Server – ROLAP –MOLAP

Unit II **12 Hours**

Data Mining: Introduction – Data Mining – Definitions – KDD vs Data Mining – DBMS vs DM – Other Related Areas – DM Techniques – Other Mining Problems – Issues and Challenges in DM – DM Application Areas.

Association Rules: Introduction – Association Rule – Methods to Discover Association Rules – Apriori Algorithm – Partition Algorithm – Pincer Search Algorithm – Border Algorithm.

Unit III **12 Hours**

Clustering Techniques: Introduction – Clustering Paradigms – Partitioning Algorithms – k-Medoid Algorithms – CLARA –CLARANS – Hierarchical Clustering – DBSCAN – BIRCH – CURE – STIRR.

Decision Trees: Introduction – Decision Tree – Tree Construction Principle – Best Split – Splitting Indices – Splitting Criteria – Decision Tree Construction Algorithm – CART – ID3.

Unit IV **12 Hours**

Genetic Algorithm: Introduction – Basic steps of GA – Selection – Cross Over – Mutation.

Other Techniques: Introduction – Neural Network – Learning in NN – Unsupervised Learning – SVM

Unit V **12 Hours**

Web Mining: Introduction – Web Mining – Web Content Mining – Web Structure Mining – Web Usage Mining – Text Mining – Hierarchy of Categories – Text Clustering.

Temporal and Spatial Mining: Introduction – Temporal Data Mining – Temporal Association Rules – Spatial Mining – Spatial Mining Tasks.

Text Book:

Arun K Pujari. ***Data Mining Techniques***, Third Edition, University Press, 2015.

Unit I : Chapter 2 (2.1 to 2.5, 2.8, 2.10 to 2.12)
Unit II : Chapter 3 (3.1 to 3.10), Chapter 4 (4.1 to 4.6, 4.13)
Unit III: Chapter 5 (5.1 to 5.10, 5.12), Chapter 6 (6.1 to 6.9)
Unit IV: Chapter 8 (8.1 to 8.5), Chapter 9 (9.1 to 9.4, 9.6)
Unit V : Chapter 10 (10.1 to 10.6, 10. 9, 10.10), Chapter 11 (11.1to 11.3, 11.12, 11.13)

Reference Books:

1. Margaret H. Dunham. ***Data Mining Introductory and Advanced Topics***, 8th Impression, Pearson Publications, 2011.
2. Rajan Chattamvelli, ***Data Mining Algorithms.*** Narosa Publishing House, 2011

Elective 1: TCP/IP

Contact Hours per Week: 5 Hours **Subject Code: U3CAE53**
Contact Hours per Semester: 60 Hours **Credits: 5**

Course Outcome:

Students, after successful completion of the course ,will be able to

CO1: To understand networking and its basics.
CO2: To understand about addressing and the media used for data transfer.
CO3: To gain knowledge about Internet Protocol.

CO4: To gain knowledge about User Datagram Protocol.
CO5: To gain knowledge about Transmission Control Protocol.

Unit I **13 Hours**

Introduction: A Brief History - Protocols and Standards – Standards Organizations – Internet Standards - Internet Administration.

The OSI Model and the TCP/IP Protocol Suite: Protocol Layers - The OSI Model – TCP/IP Protocol Suite – Addressing.

Underlying Technologies: Connecting Devices.

Unit II **13 Hours**

Introduction to Network Layer: Introduction - Switching – Packet Switching at Network Layer – Network Layer Services – Other Network Layer Issues.

IPv4 Addresses: Introduction - Classful Addressing – Classless Addressing – Special Addresses – NAT.

Unit III **11 Hours**

Internet Protocol Version 4(IPv4): Introduction - Datagrams – Fragmentation – Options – Checksum – IP over ATM – Security – IP Package.

Unit IV **11 Hours**

User Datagram Protocol (UDP): Introduction – User Datagram – UDP Services – UDP Applications – UDP Package.

Unit V **12 Hours**

Transmission Control Protocol (TCP):- TCP Services – TCP Features - Segment – A TCP Connection – State Transition Diagram – Windows in TCP – Flow Control – Error Control – Congestion Control – TCP Timers – Options – TCP Package.

Text Book:

Behrouz A. Forouzan, ***TCP/IP Protocol Suite***, Tata McGraw Hill Education (India) Private Limited, 2010.

Unit I	: Chapter 1, 2, 3.5
Unit II	: Chapter 4, 5
Unit III	: Chapter 7
Unit IV	: Chapter 14
Unit V	: Chapter 15

Reference Books:

1. Larry L.Peterson & Peter S.Daive, ***Computer Networks***, Second Edition, Harcourt Asia Pvt. Ltd., 2000.
2. William Stallings, ***Data and Computer Communication***, Sixth Edition, Pearson Education, 2000.

SBE- EMPLOYABILITY SKILLS

Contact Hours per week: 2 **Subject Code: U1PS51**

Contact Hours per Semester: 30 **Credits: 2**

Objectives:

To enrich the Employability Skills by imparting Reasoning skills, Aptitude skills and General Knowledge.

Unit I : Quantitative Aptitude – Averages, Percentage, Profit & Loss, Ratio & Proportion, Time & Work, Time & Distance, Clock. **(6-hour**

Unit II : Quantitative Aptitude –Problems on Ages, Boat & Stream, Simple Interest, Compound Interest, Area, Partnerships. **(6-hours)**

Unit III: Reasoning **(6-hours)**

Verbal Reasoning - Analogy, Classification, Series, Coding & Decoding, Blood Relations, Direction Sense Test.

Unit IV: Reasoning **(6-hours)**

Verbal Reasoning - Number Test, Ranking & Time sequence Test, Alphabet Test, Logical Venn Diagrams.

Unit V: **(6-hours)**

General Knowledge: Abbreviations, Acronyms, Famous Personalities, Important Days, Capital Cities, Currencies, Books and Authors, Inventions.

Reference Books:

1. Verbal & Non Verbal Reasoning - R.S.Aggarwal
2. Quantitative Aptitude - R.S.Aggarwal
3. Subjective & Objective Quantitative Aptitude - R.S.Aggarwal
4. Malayala Manorama Year Book, 2014

NME - 1: Basics of Computer

Contact Hours per Week: 2 Hours **Subject Code: U3CAN51**
Contact Hours per Semester: 24 Hours **Credits: 2**

Course Outcome:
Students, after successful completion of the course ,will be able to,

CO1: To understand the basic components of computer.
CO2: To know about the programming languages and operating systems.
CO3: To be aware of the generations of computer.
CO4: To identify the components of computer network.
CO5**:** To grasp about multimedia and future of computer.

Unit I **4 Hours**
Computer Basics: A simple model of a computer – Characteristics of computers.
Input / Output Units: Traditional computer Input/Output units – Other input technologies – Computer output devices.
Computer Memory: Memory cell – Memory organization – Magnetic hard disk.

Unit II **8 Hours**
Programming Languages: Programming language – Assembly language – Higher level programming languages – Compiling a high level language program – Some high level languages.
Operating Systems: Why do we Need an operating system – Batch operating system – Multiprogramming operating system – Time sharing operating system- On-line and Real-Time systems - Other facilities provided by operating systems – Personal computer operating system.

Unit III **5 Hours**
Computer Generations and Classification: First Generation of Computers – Second generation – Third generation – Fourth generation – Fifth generation – Classification of computers. **Computer Networks:** Need for computer communication networks – Communications protocols – Local area networks – Interconnecting networks - Internet and the world wide web – Internet security.

Unit IV **4 Hours**
Voice and Data Communications: Characteristics of communication channels – Allocation of communication channel - Physical communication media – Cellular communications system.

Unit V **3 Hours**
Advanced input/output interfaces: Graphical user interface – Vector graphics – Raster graphics – Accelerated graphics with GPU- Stereo display units – Other visual displays – Input devices for interaction – Speech and audio interface – Tactile interfaces.

Text Book:
V. Rajaraman, Neeharika Adabala, ***Fundamentals of Computers***. PHI Learning Pvt. Ltd., New Delhi, 6th Edition, 2015

Unit I : Chapter 1(1.2, 1.3), 3, 4(4.1, 4.2, 4.6)
Unit II : Chapter 9, 10 (10.1 to 10.7)
Unit III : Chapter 12 (12.1 to 12.5, 12.7), 13 (13.1 – 13.3, 13.5, 13.6, 13.7)
Unit IV : Chapter 14 (14.1 – 14.3, 14.8)
Unit V : Chapter 15

Reference Books:

1. Anita Goel, ***Computer Fundamentals***. Pearson India Publication, *2010.*
2. P.K. Singh, ***Computer Fundamentals***. VK Global Publications, 2015.

Core 14 - Mobile Application Development Lab

Contact Hours per Week: 5 Hours **Subject Code: U3CAC5P1**
Contact Hours per Semester: 60 Hours **Credits: 3**

Course outcome:

CO1: Develop android applications using Eclipse IDE.
CO2: Learn and Develop android real-time applications.
CO3: Export and Publish android applications.

List of Programmes :

1. Develop a sample android application using eclipse.
2. Develop an android application for registration form using Basic Views.
3. Develop an android application using Activities.
4. Develop an android application using Intents.
5. Develop an android application using Built-in Intents.
6. Develop an android application using Fragments.
7. Develop an android application using Action bar.
8. Develop an android application using Picker Views.
9. Develop an android application using List Views.
10. Develop an android application for Gallery using Image Views.
11. Develop an android application using Menus.
12. Develop an android application to save and retrieve user data using Preferences.
13. Develop an android application using 'Messaging' and 'E-Mail'.
14. Develop an android application using Maps.

Core 15 - Web Technology Lab

Contact Hours per Week: 4 Hours **Subject Code: U2CAC5P2**
Contact Hours per Semester: 48 Hours **Credits: 2**

Course outcome:

CO1: PHP code to produce outcomes and solve problems.
CO2: Display and insert data using PHP and MySQL.
CO3: Test, debug, and deploy web pages containing PHP and MySQL.

List of Programmes :

1. Creating simple webpage using PHP
2. Use of conditional statements in PHP

3. Use of looping statements in PHP
4. Creating different types of arrays in PHP.
5. Usage of array functions in PHP.
6. Creating user defined functions in PHP
7. Creation of files in PHP.
8. File manipulation using PHP
9. Creation of sessions in PHP with MySQL.
10. Creation of cookies in MySQL.
11. Creating simple applications using PHP
12. Creating simple table with constraints in MySQL.
13. Insertion, Updation and Deletion of rows in MYSQL tables
14. Searching of data by different criteria in MySQL.
15. Sorting of data in MySQL.
16. Demonstration of joining tables in MySQL.
17. Usage of subqueries in MySQL.
18. Usage of aggregate functions in MySQL.
19. Working with string, numeric and date functions in PHP.
20. Database connectivity in PHP with MySQL

Core 16 – Software Engineering

Contact Hours per Week: 4 Hours **Subject Code: U2CAC61**
Contact Hours per Semester: 48 Hours **Credits: 3**

Course outcome:

Students, after successful completion of the course ,will be able to

CO 1: Understand the phases in Software Development Process and Organizational Structure
CO 2: Understand the size and cost estimation of the software.
CO 3: Understand the Software Requirement specification and its needs.
CO 4: Understand the Software design and its guidelines.
CO 5: Understand the Verification, Validation Techniques and Maintainability of a Software

Unit I **10 hrs**

Introduction to Software Engineering: Definitions- Size Factors-Quality and Productivity factors.

Planning a Software Project: Defining the Problem-Developing Solution Strategy-Planning the Development Process-Planning an Organizational Structure.

Unit II **8 hrs**

Software Cost estimation: Software Cost Factors-Cost Estimations Techniques-Staffing Level Estimation-Estimating and Maintenance cost.

Unit III **10 hrs**

Software Requirements Definition: Software Requirement Specification-Formal Specification Techniques-Languages and Processors for Requirements Specification.

Unit IV **10 hrs**

Software Design: Fundamental Design Concepts-Modules and Modularization Criteria-Design Notations - Design Techniques-Test Plans-Milestones, Walkthroughs and Inspections - Design Guidelines.

Unit V **10 hrs**

Verification and Validation Techniques: Quality Assurance-Walkthroughs and Inspections - Static Analysis-Symbolic Execution-Unit testing and Debugging-System Testing.

Software Maintenance: Enhancing Maintainability during Development-Managerial Aspects of Software Maintenance –Configuration Management-Source-Code Metrics-Other Maintenance Tools and Techniques.

Text Book:

Richard Fairley, ***Software Engineering Concepts***, McGraw-Hill Education, 45th Reprint 2016.

Unit I : Chapters – 1 (1.1 to 1.3), 2 (2.1 to 2.4)
Unit II : Chapter – 3
Unit III : Chapter – 4
Unit IV : Chapters – 5 (5.1 to 5.4, 5.7 - 5.9)
Unit V : Chapters – 8 (8.1 to 8.6), 9

Reference Books:

1. Roger S. Pressman, ***Software Engineering,*** McGraw-Hill International Edition, 7th Edition, 2010.
2. Rajib Mall, ***Fundamentals of Software Engineering,*** Prentice Hall of India Pvt. Ltd., New Delhi-2003.

Core 17 : Cryptography

Contact Hours per Week: 4 Hours **Subject Code: U3CAC62**
Contact Hours per Semester: 48 Hours **Credits: 3**

Course Outcome:

Students, after successful completion of the course ,will be able to
CO1: To understand the fundamentals of Cryptography
CO2: To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
CO3: To understand the various key distribution and management schemes.
CO4: To understand how to deploy encryption techniques to secure data in transit across data networks
CO5: To design security applications in the field of Information technology

Unit I **9 Hours**

Introduction to the concepts of Security: Introduction – The Need for Security – Security Approaches – Principles of Security – Types of Attacks.

Cryptography Techniques: Introduction – Plain Text and Cipher Text – Substitution Techniques – Transposition Techniques – Encryption and Decryption – Symmetric and Asymmetric Key Cryptography – Possible Types of Attacks.

Unit II **10 Hours**

Computer-based Symmetric Key Cryptographic Algorithms: Introduction – Algorithm Types and Modes – An Overview of Symmetric Key Cryptography – Data Encryption Standard(DES) – International Data Encryption Algorithm (IDEA) – Advanced Encryption Standard(AES).

Unit III **11 Hours**

Computer-based Asymmetric Key Cryptographic Algorithms: Introduction – Brief History of Asymmetric Key Cryptography – An Overview of Asymmetric Key Cryptography – The RSA Algorithm – Symmetric and Asymmetric Key Cryptography.

Unit IV **9 Hours**

Public Key Infrastructure: Introduction – Digital Certificates.
Internet Security Protocols: Introduction – Secure Socket Layer (SSL) – Secure Electronic Transaction (SET) – SSL versus SET – Email Security.

Unit V **9 Hours**

User Authentication Mechanisms: Introduction – Authentication Basics – Passwords – Certificate Based Authentication – Biometric Authentication.
Network Security, Firewalls and Virtual Private Networks (VPN): Firewalls.

Text Book:

Atul Kahate, ***Cryptography and Network Security***, McGraw Hill Education Pvt. Ltd, Eighth Reprint 2017, Third Edition.

Unit I : Chapter 1 & 2 [2.1-2.6, 2.9]
Unit II : Chapter 3 [3.1 – 3.5, 3.9]
Unit III: Chapter 4 [4.1 – 4.4, 4.6]
Unit IV: Chapter 5 [5.1, 5.2] & 6 [6.1, 6.3, 6.6, 6.7, 6.9]
Unit V : Chapter 7 [7.1-7.3, 7.5,7.6] & 9 [9.3]

Reference Book:

William Stallings, ***Cryptography and Network Security***, PHI, 2008

Elective 2 – Embedded Systems

Contact Hours per Week: 5 Hours **Subject Code: U2CAE61**
Contact hour per semester: 60 Hours **Credits: 5**

Course Outcome:

Students, after successful completion of the course ,will be able to
CO1**:** Learn and obtain the basic concept of embedded systems
CO2: Learn to apply and analyze the applications in various processors, Input/output interfacing and Bus Communication
CO3: Learn interrupt service mechanisms and device driver concepts
CO4: Learn the process of memory management and basic design of real time operating system
CO5: Learn to write the programs for microcontroller and obtain basic knowledge of embedded Software Development tools

Unit I **12 Hours**

Introduction to Embedded Systems: Embedded Systems – Processor Embedded into a System – Embedded Hardware units and Devices in a System – Embedded Software in a System – Examples of Embedded System – Embedded System on-chip (Soc) and Use of VLSI Circuit design Technology – Complex systems design and processors – Design process in Embedded System – Formalization of System design – Design process and Design Examples – Classification of Embedded Systems.

Unit II **12 Hours**

8051 and Advanced Processor Architectures, Memory Organizations and Real-world Interfacing: 8051 Architecture – Real world Interfacing – Processor and Memory organizations – Memory-Types, Memory-Maps and Addresses. Design and Communication Buses for Devices Network: IO Types and Examples – Serial Communication Devices – Parallel Device Ports – Timer and Counting Devices – Serial Bus Communication Protocols.

Unit III **12 Hours**

Device Drivers and Interrupts Service Mechanism: Programmed-I/O Busy-wait Approach without Interrupt Service Mechanism – ISR Concept – Interrupt Sources – Interrupt Servicing Mechanism – Multiple Interrupts – Context and the Periods for Context Switching, Interrupt Latency and Deadline – Classification of Processors Interrupt Service Mechanism from Context-saving Angle – Direct Memory Access – Device Driver Programming.

Unit IV **12 Hours**

Real-Time Operating Systems: OS Services – Process Management – Timer Functions – Event Functions – Memory Management – Device, File and IO Subsystems Management – Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls – Real-time Operating Systems – Basic Design using RTOS – RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics – OS Security Issues.

Unit V **12 Hours**

Programming Concepts: Software Programming in Assembly Language (ALP) and in High-Level Language „C" – C Program Elements: Header and Source Files and Preprocessor Directives – Program Elements: Macros and Functions – Program Elements: Data Types – Data Structures, Modifiers, Statements, Loops and Pointers. Embedded Software Development Process and Tools: Introduction to Embedded Software Development Process and tools – Host and Target machines – Linking and Locating Software – Getting Embedded Software into the Target System – Issues in Hardware-Software Design and Co-Design.

Text Book:

RAJ KAMAL, ***Embedded Systems Architecture, Programming and Design***, 2nd Edition Tata McGraw Hill Education Private Limited, New Delhi, 2013.

Unit I : Chapter 1 [1.1 to 1.11]
Unit II : Chapter 2 [2.1, 2.2, 2.4, 2.7] & 3[3.1 to 3.3, 3.6, 3.10]
Unit III: Chapter 4
Unit IV: Chapter 8
Unit V : Chapter 5 [5.1-5.4] & 13

Reference Book:

David E.Simson, ***An Embedded Software Primer***, Pearson Education, Eighth Impression, 2009.

Elective 2 – Computer Algorithms

Contact Hours per Week: 5 Hours **Subject Code: U2CAE62**
Contact hour per semester: 60Hours **Credits: 5**

Course Outcome

Students, after successful completion of the course ,will be able to
CO 1: Learn the concept of designing an algorithm to solve real world problems
CO 2: Learn greedy method, advanced tree and graph applications to select a proper pattern matching algorithm for given problem
CO 3: Learn and familiarize with basic paradigms and data structures to solve algorithmic problems.
CO 4: Learn different classes of problems with reference to their computation difficulties
CO 5: Learn major algorithms, design paradigms and methods of analysis in algorithm design

Unit I **12 Hours**

Introduction: An Algorithm – **Performance Analysis:** Space Complexity –Time Complexity – Asymptotic Notation.

Divide and Conquer: General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort – **Quick Sort:** Performance Measurement – **Selection:** A Worst-Case Optimal Algorithm.

Unit II **12 Hours**

The Greedy Method: General Method - Container Loading – Knapsack Problem – Tree Vertex Splitting – Job Sequencing with Deadlines – Minimum-Cost Spanning Trees – Optimal Storage on Tapes –Optimal Merge Patterns – Single source Shortest Paths.

Unit III **12 Hours**

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source shortest Paths – String Editing – 0/1 Knapsack – Reliability Design – The Traveling Salesperson Problem – Flow Shop Scheduling.

Unit IV **12 Hours**

Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS

Unit V **12 Hours**

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles –Knapsack Problem.

Text Book:

Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, ***Fundamentals of Computer Algorithms***, 2nd Edition, Universities Press Pvt. Ltd., 2008.

Unit I : Chapter 1 (1.1, 1.3.1, 1.3.2, 1.3.4), 3 (3.1, 3.3 to 3.5, 3.6.1, 3.7.1)
Unit II : Chapter 4
Unit III: Chapter 5 (5.1 to 5.4, 5.6 to 5.10)

Unit IV: Chapter 6
Unit V : Chapter 7

Reference Books:

1. Anany Levitin, ***Introduction to the Design & Analysis of Algorithms***,2nd Edition, Pearson Education, New Delhi, 2008.
2. Berman and Paul, ***Algorithms***, Cenage Learning India Edition, New Delhi, 2008.

Elective 2 – Cloud Computing

Contact Hours per Week: 5 **Subject Code: U2CAE63**
Contact Hours per Semester: 60 **Credits: 5**

Course Outcome:

Students, after successful completion of the course , will be able to

CO1: To understanding cloud computing terminology.
CO2: To implement virtualization in cloud.
CO3: To gain knowledge about how to migrate our applications to the cloud.
CO4: To know the applications and standards of cloud
CO5: To know the future of cloud computing through mobile and microservices

Unit I **12 Hours**

Cloud Computing – An Overview: Introduction – History of Cloud Computing – Characteristics of Cloud – Cloud Computing Model. Issues and challenges of Cloud Computing – Advantages, Disadvantages of Cloud computing – Security, Privacy and Trust – Virtualization – Threats to Cloud Computing – Next Generation of Cloud Computing.

Cloud Computing Architecture: Introduction – Cloud Architecture - Cloud Computing models – Comparison of Service models – Deployment Models – Identity as a Service.

Unit II **12 Hours**

Virtualization in Cloud: Introduction – Virtualization – Implementation of Virtualization - Virtualization support at the OS level – Middleware Support for Virtualization - Advantages of Virtualization - Application Virtualization - Virtualization Implementations Techniques – Hardware Virtualization - Types of Virtualization – Load balancing in Cloud Computing - Logical Cloud Computing Model – Virtualization for Data Centre.

Security Management: Security Issues in Cloud Computing – Classification of Security Issues – Types of Attackers – Security risks in Cloud Computing – Security Threats against cloud Computing.

Unit III **12 Hours**

Virtualization System Specific Attacks: Attacks in Cloud Computing Environment – Attacks on Hypervisor – Security Challenges – Virtualization Security Solutions.

Web Services: Introduction – Amazon Web Services – Microsoft Azure.

Migrating Applications to the Cloud Computing: Introduction - Motivations for Migration – Issues in Migrating the Applications to the Cloud – Challenges in Migrating the Applications to the Cloud – Solutions for the Challenges in Migration of Applications to Cloud – Types of Migration – Planning for Migrating the Application to Cloud – Migration Roadmap – Cloud Bursting.

Unit IV **12 Hours**

Cloud Computing Applications: Introduction – Business Applications – Finance and Banking Application – Cloud Computing in Education.

Standards in Cloud Computing: Introduction - Standardization Activities – Challenges – Fields of Standardization – Role of Standards in Cloud Computing Environments- Standardization Organizations in Cloud Computing.

Unit V **12 Hours**

Mobile Cloud Computing: Introduction – Need of Mobile Cloud Computing – Mobile Computing Architecture – Technologies of MCC – MCC Applications – Issues in MCC – Challenges in Building Applications – Platforms.

Microservices: Introduction – Need of Microservices – Microservice Architecture – Benefits of Microservices – Drawbacks of Microservices – Communication Mechanisms – Decentralized Data Management – Essential Checklists for Migration from Monolithic to Microservices.

Text Book:

V.K.Pachghare, ***Cloud Computing***, PHI Learning Private Limited, 2016

Unit I	: Chapter 1, 2.
Unit II	: Chapter 3, 5 (5.3 to 5.7)
Unit III	: Chapter 6(6.2 to 6.5), 7 (7.1 to 7.3), 10
Unit IV	: Chapter 11, 12.
Unit V	: Chapter 13, 14 (14.1 – 14.8) .

Reference Books:

1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, ***Cloud Computing a Practical Approach***, Tata McGraw-Hill Education Private Limited, New Delhi, 2010 Edition, Fifth Reprint 2011.
2. Barrie Sosinsky, ***Cloud Computing Bible***, Wiley India Private Limited, Reprint 2011

SBE-6 - Internet of Things

Contact Hours per Week: 2 Hours **Subject Code: U3CAS61**
Contact Hours per Semester: 24 Hours **Credits: 2**

Course Outcome:

Students, after successful completion of the course ,will be able to

CO1: To understand the basics of IoT and Machine to Machine Communication
CO2: To gain knowledge about the protocols used for Communication.
CO3: To gain knowledge about processing of data acquired from IoT.
CO4: To understand the working principles of Sensors.
CO5: To understand the basics of Embedded Devices.

Unit I **5 Hours**

Internet of Things: **An Overview**:- Internet of Things – IoT Conceptual Framework – IoT Architectural View – Technology behind IoT – Sources of IoT – M2M Communication – Examples of IoT.

Unit II **5 Hours**

Internet Connectivity Principles:- Introduction – Internet Connectivity – Internet-Based Communication – IP Addressing in the IoT – Media Access Control – Application Layer Protocols: HTTP, HTTPS, FTP, Telnet and Others.

Unit III **5 Hours**

Data Acquiring, Organising, Processing and Analytics:- Introduction – Data Acquiring and Storage – Organising the Data – Transactions, Business Processes, Integration and Enterprise Systems – Analytics – Knowledge Acquiring, Managing and Storing Processes.

Unit IV **5 Hours**

Sensors, Participatory Sensing, RFID and Wireless Sensor Networks:- Introduction – Sensor Technology – Participatory Sensing, Industrial IoT and Automative IoT, Actuator, Sensor Data Communication Protocols – Radio Frequency Identification Technology – Wireless Sensor Networks Technology.

Unit V **4 Hours**

Prototyping the Embedded Devices for IoT and M2M:- Introduction – Embedded Computing basics – Embedded Platforms for Prototyping – Things always connected to the Internet/Cloud.

Text Book:

Raj Kamal, ***Internet of Things Architecture and Design Principles***, McGraw Hill Education (India) Private Limited, 2017.

Unit I: Chapter 1
Unit II Chapter 4
Unit III Chapter 5
Unit IV: Chapter 7
Unit V: Chapter 8

Reference Book:

Arshdeep Bahga and Vijay Madisetti, ***Internet of Things A Hands-on Approach***, University Press (India) Private Limited, 2018

NME 2 – Introduction to Multimedia

Contact Hours per Week: 2 hrs **Subject Code: U3CAN61**
Contact Hours per Semester: 24 hrs **Credits: 2**

Course Outcome:

Students, after successful completion of the course ,will be able to

CO1: To know the resources and products of multimedia
CO2: To understand the multimedia architecture

CO3: To use the text, graphics in multimedia
CO4: To understand the digital audio format
CO5: To know the multimedia video format

Unit I **5 Hours**

Introduction: Objectives – Brief History of Multimedia – What is Multimedia? - The Multimedia Market – Resources for multimedia developers.
Products and Evaluation: Objectives – Types of Products.

Unit II **5 Hours**

Hardware, operating systems and software: Multimedia Computer architecture.
Text: Objectives-Element of Text - Using Text in Multimedia Applications-Hypertext.

Unit III **5 Hours**

Graphics: Graphics Files and Application Formats- Obtaining Images for Multimedia use -Using Graphics in Multimedia Applications.

Unit IV **5 Hours**

Digital Audio: Digital Audio systems- MIDI-Audio File Formats-Using Audio in Multimedia Applications.

Unit V **4 Hours**

Digital Video and Animation: Characteristics of Digital video- Video capture and Playback systems-Computer Animation-Using Digital video in Multimedia Applications.

Text Book

David Hillman, ***Multimedia Technology and Applications,*** GALGOTIA publication, Reprint 2015

Unit I: Chapter 1 (Pg. No. 1-10, 14-19), 2 (Pg. No. 21-33)
Unit II: Chapter 3 (Pg. No. 53-63), 4 (Pg. No. 67-71, 76-80)
Unit III: Chapter 5 (Pg. No. 93-104)
Unit IV: Chapter 6 (Pg. No. 112-121)
Unit V: Chapter 7 (Pg. No. 129- 133, 139-146)

Reference Book :

Principles of Multimedia, Ranjan Parekh,TMH, 2006

Project and Viva - Voce

Contact Hours per Week: 5 Hrs **Subject Code: U1CA6PR**
Contact Hours per Semester: 60 Hrs **Credits: 5**

Course Outcome:
Students, after successful completion of the course ,will be able to

CO1 : Designed to help students develop practical ability and knowledge about practical tools techniques in order to solve real life problems related to the

industry, academic institutions and computer science research.

CO2 : Involves practical work for understanding and solving problems in the field of computing.

CO3 : Students will select individually Commercial or Technical Project based on Application D evelopment Technologies.

CO4 : With the known technologies they can develop the software.

Core 18 Lab – Dot Net Programming Lab

Contact Hours per Week: 5 Hours **Subject Code: U3CAC6P1**
Contact Hours per Semester: 60 Hours **Credits: 3**

Course Outcome

Students, after successful completion of the course ,will be able to

CO1: Basic Programming in Dot NET Environment.
CO2: To develop Windows based applications in Dot NET using VB and C#.
CO3: Proficient to develop Web applications using ASP.NET

List of Programmes :

VB.NET

Console Applications:

1. Write a program in VB.Net to perform Matrix Manipulations.
2. Write a program in VB.Net to perform Array List Operations.

Windows Applications:

3. Write a program in VB.Net to perform File Operations using Streams.
4. Write a program in VB.Net to design a Scientific Calculator.
5. Create Inventory Management System using Database.

C# :

Console Applications:

6. Write a program in C#.Net to demonstrate Error Handling.
7. Write a C#.Net program to implement Multi Level Inheritance.

Windows Applications:

8. Write a C#.Net program to design book store management.

ASP.NET

9. Write an ASP.Net program to find the Factorial of a given number by using Function
10 .Write an ASP.Net program to generate a Fibonacci series by using Subroutine
11. Write a program containing the following controls:
    - A ListBox
    - A Button
    - An Image
    - A Label

    The listbox is used to list items available in a store. When the user clicks on an item in the listbox, its image is displayed in the image control. When the user clicks the button, the cost of the selected item is displayed in the control.
12. Create Course Registration Application using Validation Controls.

13. Create college student registration as web page in online using Visual Basic.
14. Create a web page for employee details of an organization using C#.

Core 19 - Multimedia Lab

Contact Hours per Week: 3 **Subject Code: U2CAC6P2**
Contact Hours per Semester: 36 **Credits: 2**

Course Outcome

Students, after successful completion of the course ,will be able to

CO1 : To increase the ability to edit and add special features to the images.
CO2 : To increase the ability to create flash movie.
CO3 : To design various applications such as cards, invitations, certificates etc.

List of Programmes :

1. Merge more than one image into a single file.
2. Design a visiting card.
3. Implement Flaming Hot Fire Text.
4. Implement Rain effect.
5. Using Photoshop to change the color of an image.
6. Implement Ripple effect.
7. Create a water drop effect
8. Implement Blinking effect.
9. Create Out of Bound effect.
10. Place an image into a text.
11. Create a text animation.
12. Create a picture animation.
13. Create an animation to indicate a ball bouncing on steps.
14. Create an animation to represent the growing moon.
15. Implement Masking Concept.
16. Shape Tweening.
17. Create a Fog effect.
18. Animate a Globe.
19. Create an animation using Guide Layer.
20. Procedure to implement moving ball using mouse drag (Action Script).

Self-Learning Courses

BCA - UNIX and Shell Programming

Credit: 5 **Subject Code: U1CASL51**
Total Marks: 100
Objectives:

- To know about to get through understanding of the kernel.
- To understand the file organization and management.
- To know the various system calls.

- To have knowledge of process architecture, process control and scheduling and memory management.

Unit I

Getting Started: The Operating System-The UNIX Operating System-Knowing Your Machine-Knowing Your Keyboard-The System Administrator- Logging In and Out-Trying Out Some Commands-Two important Observations-When Things Go Wrong-Working with Files and Directories-How it All Clicked-Linux and GNU-Inside UNIX.

Understanding the UNIX Command: General Features of a Command-The PATH: Locating Commands-Internal and External Commands-Command Structure-Flexibility of Command Usage-man: On-Line Help-The man Documentation- info:The Texinfo Documentation-whatis and apropos: Which Command Will Do the job.

Unit II

General-Purpose Utilities: passwd: Change your Password-who and w: Know the Users-tty: Know Your Terminal –lock: Lock Your Terminal-stty: Set Terminal Characteristics-script:Record Your Session-clear and tput: Clear Your Screen-uname:Know Your Machine's Name-date:Display the System Date-cal:The Calendar-calendar:A Useful Reminder Mechanism-bc:The Calculator.

The vi/vim Editor: Vi Preliminaries-Quitting vi-Inserting and Replacing Text-Saving Text-Exit to the UNIX Shell- String Search –Searching with Regular Expressions-Search and Replace-Handling Multiple Files-Marking Text –Filtering Text-Named Buffers-Recovering Multiple Deletions-Abbreviating Text-Customizing the Keyboard-Customizing the Environment.

Unit III

The File System:The File-What's in a (File) Name-The Parent-Child Relationship-The UNIX File System-pwd: Knowing Your Current Directory-Absolute Pathnames-cd: Changing Directories-Relative Pathnames-mkdir: Making Directories-rmdir: Removing Directories- cp: Copying Files- rm: Deleting Files-mv: Renaming Files-cat: Displaying and Creating Files-file:Know the File Types-lp and cancel:Printing a File-df: Finding Out the Free Disk Space-du:Finding Out Your Own Consumption-compress,gzip and zip:Compress Your Files.

File Attributes: ls-ls –l-Listing Directory Atrributes-File Permission-chmod:Changing File Permissions-Directory Permissions-umask:Default File Permissions-File Ownership-chown and chrp:Changing File Ownership-File Modificationans Acess Times-touch: Changing the Time Stamps-File systems and Inodes-ln-Symbolic Links-find.

Unit IV

The Shell: The Shell as Command Processor-Pattern Matching-The Wild Cards-Escaping-Quoting-Escaping and Quoting in echo-Redirection-/dev/null and/dev/tty:Two Special Files-Pipes-tee:Splitting a Stream-Command Substitution-Shell Variables- Shell Scripts-The Shell's Treatment of the Command Line-The other Shells-More Wild Cards in the Korn Shell and bash.

Simple Filters:more: Paging Output-wc: Line,Word and Character Counting-od: Displaying Data in Octal-pr: Paginating Files-cmp: Comparing Two Files-diff: Converting One File to Another-comm: What is common?- head: Displaying the Beginning of a File- tail: Displaying the End of a File-cut: Slitting a File Vertically-paste: Pasting Files-sort: Ordering a File-tr: Translating Characters-uniq: Locate Repeated and Non repeated Lines-nl: Line Numbering.

Unit V

Filters using Regular Expressions-grep and sed: The sample Database-grep-grep options-Regular Expressions-Round One-egrep and fgrep-Regular Expressions-Round Two-sed-Line Addressing Context Addressing- Editing Text-Substitution-Regular Expressions-Round-Three.

Programming with awk: awk Preliminaries-Splitting a Line into Fileds-printf-The Comparison Operators-Number Processing-variables-Reading the Program from a File-The BEGIN and END Sections-Positional Parameters-getline:Making awk Interactive-Built-In Variables-Arrays-Functions-Control Flow-The if Statement-Looping:for and while.

Text Book:

Your UNIX the Ultimate Guide, Sumitabha Das, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2009.

Unit I - Chapter 1, 2
Unit II - Chapter 3, 4(4.1 to 4.5,4.14 to 4.24)
Unit III - Chapter 6,7
Unit IV - Chapter 8,9(9.1 to 9.15)
Unit V - Chapter 15,16

Reference Book:

UNIX Shell Programming, Yashavant P Kanetkar, BPB Publications, 1996.

System Software

Credit: 5 **Subject Code: U1CASL52**

Total Marks: 100

Objectives:

- It covers the design and implementation of various types of system utilities software.
- It illustrates how the utility software interacts with operating system.

Unit I

Background: Introduction-System software and Machine Architecture – The simplified Instructional Computer – Traditional Machines – RISC Machines.

Unit II

Assemblers: Basic Assembler Functions – Machine-Dependent Assembler Features – Machine-Independent Assembler Features – Assembler Design Options.

Unit III

Loaders and Linkers: Basic Loader Functions – Machine-Dependent Loader Features - Machine-Independent Loader Features – Loader Design Options.

Unit IV

Macro Processors: Basic Macro Processor Functions - Machine-Independent Macro Processor Features – Macro Processor Design Options.

Unit V

Compilers: Basic Compiler Functions - Machine-Dependent Compiler Features – Machine-Independent Compiler Features – Compiler Design Options.

Text Book:

System Software, Leland L. Beck, D. Manjula, 3rd Editions, Pearson Education, 2008.

Unit I	:	Chapter 1
Unit II	:	Chapter 2 (2.1 to 2.4)
Unit III	:	Chapter 3 (3.1 to 3.4)
Unit IV	:	Chapter 4 (4.1 to 4.3)
Unit V	:	Chapter 5 (5.1 to 5.4)

Reference Book:

System Software, J. Nithyashri, 2nd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.

Discipline : **Computer Applications**
CHOICE BASED CREDIT SYSTEM

VALUE ADDED COURSES (UG Only)

Course Name	Internal Mark = Total Mark	Subject Code
R Programming	100 = 100	V1CA1
Virtual and Augmented Reality	100 =100	V1CA2
Client Side Web Development	100 =100	V1CA3
Hardware Trouble Shooting and Networking	100 =100	V1CA4P
Lab: Office Automation	**100=100**	**V1CA5**
Lab: Creative Game Development using Greenfoot	**100=100**	**V1CA6**

R Programming

Subject Code : V1CA1

Contact Hours per Semester : 30 Hrs
Course Outcomes:

CO1	To get familiarity about Working Environment of R.
CO2	To collect detailed information using R tutorials package
CO3	Develop modules using loop functions and debugging tools in R.
CO4	Effective use of libraries in R to export and import external data.
CO5	Develop modules using Lists, Dataframes and Graphics in R.

Unit I **6 Hrs**

A Short Introduction to R: Introduction – Installing R – Getting Started – Some Information on R Commands – Special Values – Objects – Functions – Simple Manipulations – Numbers and Vectors – Matrices and Arrays – Factors – Lists – Data Frames.

Unit II **6 Hrs**

Programming Using R: Introduction – Function Creation – Scripts – Logical Operators – Conditional Statements – Loops in R –Switch Statement.

Unit III **6 Hrs**

Lists and Data Frames: Introduction – Creating a List – Common List Operations – Recursive List – Creating a Data Frame – Common Data Frame Operations – Using lapply() and sapply() Functions.

Unit IV **6 Hrs**

Import and Export: Introduction – Saving and Loading R data – Import and Export to CSV Files – Importing Data from SAS – Import and Export Via ODBC.

Unit V **6 Hrs**

Graphics: Introduction – Basic Plots – Labeling and Documenting Plots – Adjusting the Axes – Specifying Colors – Specifying Fonts – Specifying Sizes – Plotting Symbols.

Text Book:

R for Beginners in 24 Hours, Sandip Rakshit , McGraw Hill Education, 2017.

Unit I : Chapter 1: 1.1 – 1.12
Unit II : Chapter 2: 2.1 – 2.7
Unit III : Chapter 3: 3.1 – 3.7
Unit IV : Chapter 6: 6.1 – 6.5
Unit V : Chapter 12: 12.1 – 12.8

Virtual and Augmented Reality

Subject Code : V1CA2

Contact Hours per Semester : 30 Hrs

Course Outcomes:

CO1	To understand the basics of augmented and virtual reality.
CO2	To learn about content development
CO3	To learn about the basics of virtual reality displays
CO4	To learn how to develop a virtual reality project
CO5	To plan the strategy in developing the virtual reality project.

Unit I **6 Hrs**

Computer Generated Worlds: What is Augmented Reality? – Head-Up Displays – Helmet-Mounted Sights and Displays – Smart Glasses and Augmenting Displays – What is Virtual Reality?

Unit II **6 Hrs**

Understanding Virtual Space: Defining Visual Space and Content – Defining positions and Orientation in Three Dimensions – Navigation.

UNIT III **6 Hrs**

Components Technologies of Head-Mounted Displays: Display Fundamentals – Related Terminology and concepts.

Unit IV **6 Hrs**

Evaluating your project – Accessing your projects Technology needs – What is the elevator pitch for my project? - What are my goals and objectives? - What problem does my project uniquely solve? - Who is the target market? - What should the end-user experience be? - Choosing Virtual Reality - Choosing Augmented Reality.

Unit V **6Hrs**

Planning Your Virtual Reality Project: Defining Your Virtual Reality Project - Exploring Design Principles in Virtual Reality - Defining Your Social Experience.

Text Books:

1. Practical Augmented Reality by Steve Aukstakalnis, Addison Wesley, 2017
   Unit I: Chapter 1
   Unit II: Chapter 2
   Unit III: Chapter 4
2. Virtual and Augmented Reality for Dummies by Paul Mealy, John Wiley & Sons Inc, 2018
   Unit IV: Chapter 6
   Unit V: Chapter 7

Reference Books:

1. Virtual Reality Headsets – A Theoretical and Pragmatic Approach by Philippe Fuchs, Judith Guez, Olivier Hugues, Jean-François Jégo, Andras Kemeny & Daniel Mestre, CRC Press, 2017
2. Understanding Virtual Reality Interface, Application and Design by William R. Sherman, Alan B.Craig, Morgan Kaufmann Publishers, 2003

Client Side Web Development

Subject Code : V1CA3

Contact Hours per Semester : 30 Hrs

Course Outcomes:

CO1	To get familiar with basics of the Internet Programming.
CO2	Implement interactive web page(s) using HTML.
CO3	Design web page(s) using HTML with Cascading Style Sheets.
CO4	Realise the importance of Javascript for web development.
CO5	Design interactive web page(s) using Dreamweaver.

Unit I **6 Hrs**

HTML: The Language of the web: what is HTML? – Structuring your HTML pages –Adding Pictures – Adding Links – Creating Tables – More Advanced Tables – What is Web Form? – Choosing Form Elements – Using The Input Tags – Using Other Form Elements – Creating Lists – The Art of Good HTML – Your Next Steps With HTML –HTML Reference Tables – Tables, List, Links, Images.

Unit II **6 Hrs**

Designing Effective Navigation: What is Navigation? – Laying Out Your Navigation – Grouping the Option – Tabbed Navigation – Dropdown Menus – Using Icons – The Role Of the Homepage – You are Here – Encouraging Exploration – Adding a Search Engine – Effective Error Messages – 14 Tips for Effective Links.

Unit III **6 Hrs**

CSS:Giving Your Pages Some Style: Why Use CSS? – How CSS Transforms HTML –How CSS Describes Design – Adding CSS to Your Site – How to Change Colors –Styling Your Text – Padding, Border and Margin – Dividing the Page Up – Styling With Class – Advanced CSS Selectors – Creating a Simple Layout – Styling the Content – Advanced Positioning – List Bullets and Numbers – Creating a Navbar With CSS – Printer-friendly Pages – Next Steps With CSS and references.

Unit IV **6 Hrs**

Javascript for Interactive Pages: What is Javascript? – How to Add Javascript – Creating Functions – Responding to User Actions – Showing and Hiding Content – How it Works – Adding a Toggle Routine – Simple Form Validation – Checking Text Boxes – More Advanced Form Tests – Customizing by Date – Opening New Windows – Adding Random Content – Adding Photo Slideshow – Saving Time with jQuery – 3 Quick jQuery Examples.

Unit V **6 Hrs**

Tools for Website Design: Using Microsoft Word – HTML and Visual Editors – Introducing DreamWeaver – A Dreamweaver Tour.

Measuring Success: Measuring Visitor Interaction – Installing Google Analytics – What the Numbers Mean – Other Important Metrics – Surveying Customers – Creating a Survey – Enabling Evolution.

Text Book:

Web Design in easy steps – Fifth edition, Sean Mcmanus , Tata McGraw Hill Eduction , 2011.

Unit I : Page No: 85 to 106
Unit II : Page No: 63 to 83
Unit III : Page No: 107 to 131
Unit IV : Page No: 137 to 156
Unit V : Page No: 167 to 172, 223 to 231

Hardware Trouble Shooting and Networking

Subject Code : V1CA4P

Contact Hours per Semester : 30 Hrs

Course Outcomes:

CO1	To know about the basic hardware components
CO2	Assemble/setup and upgrade personal computer systems.
CO3	Diagnose and troubleshoot microcomputer systems hardware and software, and other peripheral equipment

1. Front panel indicators & switches and Front side & rear side Connectors.
2. To know about CPU Layout: SMPS, Motherboard, HDD, RAM, DVD.
3. Configure BIOS setup program and troubleshoot the typical problems using BIOS utility.
4. Assembling and Disassembling of Laptop to identify the components.
5. Assembling a system
6. Install Hard Disk and configure to the PC's
7. Assemble a system with add on cards and check the working condition of the system and install OS.
8. Installation windows OS and Linux OS
9. Importance of networking, configuring networking, TCP/IP, Routing, VLAN, VPN
10. Installation and Configure windows server OS
11. Windows server network installation, file system security privileges
12. Windows firewall, hardware firewall, rules framing for file accessing and internet accessing
13. Installation of Hard Disk and configure hard disk as RAID.

Lab: Office Automation (For UG Only)

Subject Code: V1CA5

Contact Hours per Semester:30 Hours

Course Outcome:

Students, after successful completion of the course ,will be able to,

CO1: To use MS Word to create various types of documents.
CO2: Able to create and format spreadsheets, including the use of mathematical formula.
CO3: To create a presentation containing both text and graphics.
CO4 : To manipulate data with MS-access.

List of Programmes :

1. Working with Explore [Files / Folders : Create , Copy , Paste , Delete, Rename]
2. Create and edit a document
3. Table Manipulation
4. Mail Merge
5. Creation of worksheet and Editing.
6. Data sorting-Ascending and Descending
7. Mark list preparation for a student
8. Manipulating Excel Functions.
9. Drawing Graphs.
10. Create & Edit Database Table
11. Manipulating query commands from the Database Table
12. Report Generation
13. Slide Layout generation
14. Slide animation
15. Slide Transition Effects

Lab: Creative Game Development using Greenfoot (For UG Only)

Credits:

Contact Hours per Semester: 30 hours **Subject Code:** V1CA6

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to

CO1: To understand the basics in java.
CO2: To know how java environment make interactive game development environment
CO3: To work on real time environment

List of Programmes :

1. Implementation of basic scenario creation
2. Implementation of superclass and subclasses
3. Implement actions to actors

4. Implementation of keyboard movement to actor
5. Implementation of inheritance
6. Implementation of mouse movement to actor
7. Orientation changing of object
8. API implementation within the game
9. Timer, Counter implementation in games
10. Keyboard controls implementation
11. Sounds implementation of games
12. Write programming statements to switch between two images.
13. Adding GIF images to the games
14. Adding next levels to the game

Program Name : Master of Computer Applications
Discipline : Computer Applications
(For those who join in June 2020 and after)

1) **Course Objectives :**

MCA is a course exclusively designed to meet the IT requirements of IT Trained Students for various organizations. The well balanced course significantly emphasizes on planning, designing and building of complex commercial application software and system software. The course also places equal importance on the functional knowledge in various areas. A two years full-time MCA course is not just a postgraduate course; it is also a complete professional grooming for students for a successful career in the IT Industry.

2) **Eligibility for admission :**

A pass in a recognized Bachelor's degree of minimum 3 years duration in **BCA, Bachelor Degree in Computer Science Engineering or equivalent degree or passed B.Sc / B.Com / B.A with Mathematics at 10 + 2 level or at Graduation level** and obtained atleast 50% marks(45% marks in case of candidates belonging to reserved category) in the qualifying degree examinations.

3) **Duration of the Course : 2 years**
4) **Course Scheme :**

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
I	Core 1	Digital Principles and Computer Organization	4	4	40+60=100	P20CAC11	Employability	New
	Core 2	Java Programming	4	4	40+60=100	P20CAC12	Skill Development	New
	Core 3	Open Source Technology	4	4	40+60=100	P20CAC13	Skill Development	New
	Core 4	Software Engineering	3	3	40+60=100	P20CAC14	Employability	New
	Elective I	Operating System / Computer Graphics/ Distributed Operating Systems	5	5	40+60=100	P20CAE11/ P20CAE12/ P20CAE13	Employability/ Employability/ Employability	New
	Core 5 – Lab	Java Programming Lab	5	3	40+60=100	P20CAP11	Skill Development	New
	Core 6 – Lab	Open Source Programming Lab	5	3	40+60=100	P20CAP12	Skill Development	New

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
II	Core 7	Python Programming	4	4	40+60=100	P20CAC21	Skill Development	New
	Core 8	Relational Database Management System	4	4	40+60=100	P20CAC22	Employability	New
	Core 9	Data Communications and Networks	3	3	40+60=100	P20CAC23	Employability	New
	Elective II	Mobile Computing/ Data Mining/ Cloud Computing	5	5	40+60=100	P20CAE21/ P20CAE22/ P20CAE23	Employability/ Employability/ Skill Development	New
	NME	Internet and Web Designing	4	4	40+60=100	P20CAN21	Skill Development	New
	Core 10 – Lab	LAB : Python Programming	5	3	40+60=100	P20CAP21	Skill Development	New
	Core 11 – Lab	LAB :Relational Database Management System	5	3	40+60=100	P20CAP22	Skill Development	New

SEMESTER - I
Core 1 - Digital Principles and Computer Organization

Contact Hours per week: 4 Hrs
Contact Hour per Semester: 48 Hrs
Credits: 4 **Subject Code: P20CAC11**

COURSE OUTCOMES:
Students, after successful completion of the course ,will be able to
CO1: Know about digital logic design.
CO2: Gain knowledge about logical circuits.
CO3: Understand the basics of a computer.
CO4: Understand the architecture of computer.
CO5: Obtain in-depth knowledge of micro programming.

Unit I: **10 Hrs**
Binary Systems: Digital Computers and Digital Systems – Binary Numbers – Number Base conversion – Octal and Hexadecimal numbers – Binary Codes.
Boolean Algebra and Logic Gates: Basic definitions – Axiomatic definition of Boolean Algebra – Basic theorems and properties of Boolean Algebra – Boolean functions – Canonical and standard forms – Other logic operations – Digital logic gates – IC digital logic families.

Unit II: **10 Hrs**
Simplification of Boolean Function: The map method – Two and Three variable maps - Four variable maps - Five and Six variable maps - Don't-care conditions.

Combinational logic: Introduction - Design procedure - Adders - Subtractors.
Combinational logic with MSI and LSI: Decoders – Multiplexers.
Sequential Logic: Introduction - Flip-Flops -Triggering Flip-Flop.

Unit III: **10 Hrs**

Basic structure of Computers: Computer types - Functional units - Basic operational concepts - Bus structures – Software - Historical Perspective.
Machine instructions and programs: Memory location and addresses - Memory operations - Instructions and Instruction Sequencing - Addressing modes - Assembly language - Basic Input / Output Operations.

Unit IV: **9 Hrs**

Input / output organization: Accessing I / O devices - Interrupts - Direct Memory Access (DMA) - Buses - Interface Circuits.
The memory system: Read Only Memories - Cache memories.

Unit V: **9 Hrs**

Basic Processing Unit: Some fundamental concepts - Execution of a complete instruction - Multiple-Bus organisation - Hardwired control – Micro Programmed Control.
Pipelining: Basic concepts - Data Hazards - Instruction Hazards.

Text Books:

1) M.Morris Mano, ***Digital Logic and Computer Design,*** Pearson Prentice Hall, Thirteenth Impression, 2011.
Unit I: Chapter 1 (1.1 to 1.4, 1.6), 2 (2.1 to 2.8)
Unit II: Chapter 3 (3.1 to 3.4, 3.8), 4 (4.1 to 4.4), 5 (5.5, 5.6), 6 (6.1 to 6.3)
2) Carl Hamacher, Zvonko Vranesic, Safwat zaky, ***Computer Organization,*** Tata McGraw Hill Education Private Limited, Fifth Edition, 2012.
Unit III: Chapter 1(1.1 to 1.5, 1.8), 2(2.2 to 2.7)
Unit IV: Chapter 4(4.1, 4.2, 4.4 to 4.6), 5 (5.3, 5.5)
Unit V: Chapter 7(7.1 to 7.5), 8(8.1 to 8.3)

Reference Books:

1) Donald P.Leach, Albert Paul Malvino, ***Digital Principles and Applications,*** TMH 2001.
2) S.Salivaganan, S.Arivalagan, ***Digital Circuits and Design,*** Vikas Publishing House Pvt Ltd, Third Edition – 2007
3) M.Morris Mano, ***Computer System Architecture,*** Pearson Prentice Hall, Third Edition, 2006.

Core 2 - Java Programming

Contact Hours per Week: 4 Hrs
Contact Hours per Semester: 48 Hrs
Credits: 4 **Subject code: P20CAC12**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to
CO1: Demonstrate the principles of object oriented programming concepts and solve simple problems using the fundamental syntax and semantics of the java programming

language

CO2: Understand the behavior of primitive data types, operators and decision & iteration control structures.

CO3: Demonstrate the ability to use class and its types, constructor, overloading, overriding and arrays in a Java program.

CO4: Understand the concept of package, interface, multithreading, exception handling.

CO5: Acquire the knowledge about applet class and creating the applet animation programs.

Unit I **9 Hrs**

An Overview of Java: Object Oriented Programming – A First Simple Program – Two Control statements – Using Blocks of code – Lexical issues – The Java class libraries.

Data types, Variables and Arrays: Java is strongly typed language – The primitive types – Integers – Floating point types – Characters – Booleans – A closer look at Literals – Variables – Type conversion and Casting – Automatic type promotion in expressions – Arrays.

Unit II **10 Hrs**

Operators: Arithmetic operators – The Bitwise operators – Relational Operators – Boolean logical operators – The Assignment operator – The ? operator – Operator precedence – Using parentheses.

Control Statements: Java's selection statements – Iteration statements – Jump statements.

Introducing Classes: Class fundamentals – Declaring Objects – Assigning Object reference variables – Introducing methods – Constructors – The this keyword – Garbage collection – The finalize( ) method.

A closer look at methods and classes: Overloading methods – Using object as parameters – A closer look at argument passing – Returning objects – Recursion – Introducing access control – Understanding static – Introducing final – Introducing nested and inner classes – Using command line arguments.

Unit III **10 Hrs**

Inheritance: Inheritance basics – Using super – Creating a multilevel hierarchy – When constructors are executed – Method overriding – Dynamic method dispatch – Using abstract classes – Using final with inheritance – The Object class.

Packages and Interfaces: Packages – Access Protection – Importing packages – Interfaces

Unit IV **10 Hrs**

Exception Handling: Exception handling fundamentals – Exception types – Uncaught exceptions – Using try and catch – Multiple catch clauses – Nested try statements – throw – throws – finally – Java's Built-in Exceptions – Creating your own Exception subclasses – Chained Exceptions – Three Recently Added Exception Features - Using Exceptions.

String Handling: The String constructors – String length – Special String operations – Character Extraction – String Comparison – Searching Strings – Modifying a String – Data Conversion using valueOf( ) – Changing the case of characters within a String – Joining Strings – Additional String Methods - String Buffer.

Unit V **9 Hrs**

Multithreaded programming: The Java Thread model – The Main Thread – Creating a Thread – Creating Multiple Threads – Using isAlive( ) and join( ) – Thread priorities – Synchronization – Inter thread communication – Suspending, Resuming and Stopping Threads – Obtaining A Thread's State - Using Multithreading.

The Applet Class: Two types of Applets - Applet basics – Applet Architecture – An Applet skeleton – Simple Applet Display methods – Requesting Repainting – Using the status window – The HTML APPLET tag – Passing parameters to Applets – getDocumentBase( ) and getCodeBase( ) – AppletContext and showDocument( ) – The AudioClip Interface – The AppletStub Interface – Outputting to the console.

Text Book:

Herbert Schildt, ***Java The Complete Reference,*** McGraw Hill Education Private Limited, Ninth edition, 2017.

Unit I - Chapter 2, 3 (Pages 17 to 58)
Unit II - Chapter 4 (Pages 61 to 79), 5 (Pages 81 to 108) , 6 (Pages 109 to 126), 7 (Pages 129 to 154)
Unit III - Chapter 8 (Pages 161 to 186), 9 (Pages 187 to 207)
Unit IV - Chapter 10 (Pages 213 to 232), 16 (Pages 413 to 438)
Unit V - Chapter 11 (Pages 233 -261), 23 (Pages 747 to 767)

Reference Books:

1) Steven Holzner et al, ***Java 2 Programming Black book,*** Dreamtech press, 2008.
2) Rajkumar Buyya, S.Thamarai Selvi, Xingchen Chu, ***Object Oriented Programming With Java,*** Tata McGraw Hill, 2009.
3) Dr. G.T. Thampi, ***Object Oriented Programming in Java,*** DreamTech Press, 2009.

Core 3 - Open Source Technology

Contact Hours per Week: 4 Hrs
Contact Hours per Semester: 48 Hrs
Credits: 4 **Subject code: P20CAC13**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to
CO 1 : Learn the basic concepts in PHP and gain knowledge of dynamic website.
CO 2 : Learn arrays, strings and date functions in PHP
CO 3 : Learn different types of functions and its uses in PHP
CO 4 : Learn the basic design of database, table creation and modifications in MySQL.
CO 5 : Learn to build Dynamic web site using PHP and Database connectivity.

Unit I **10 Hrs**

PHP Crash Course: Before you begin – Creating a Sample Application – Embedded PHP in HTML – Adding Dynamic Content – Accessing form variables – Understanding identifiers. Examining Variable types – Declaring and using Constants – Understanding Variable Scope. Using operators – Working out the form totals – Understanding precedence and Associativity – Using variable functions. Making Decisions with Conditionals - Repeating actions through iteration. – Breaking out of a Control Structure or Script – Employing Alternative Control Structure Syntax.

Unit II **8 Hrs**

Using Arrays: Array – Numerically indexed arrays – Arrays with different indices – Array operators – Multidimensional Arrays.

String Manipulation and Regular Expressions: Creating a sample application: Smart Form Mail – Formatting Strings – Joining and Splitting Strings with String Functions – Comparing Strings.

Managing the Date and Time: Getting the date and Time from PHP – Converting between PHP and MySQL Date formats – Calculating Dates in PHP – Calculating Dates in MySQL – Using Microseconds.

Unit III **8 Hrs**

Reusing Code and Writing Functions: The Advantages of Reusing code –Using require() and include(): Filename extensions and require() – Using require() for website templates. Using Functions in PHP – Defining your own functions – Examining Basic Function Structure – Using Parameters – Understanding Scope – Passing by reference versus Passing by value – Using the return Keyword – Implementing Recursion.

Unit IV **10 Hrs**

Creating Your Web Database: Creating Databases and Users – Setting Up Users and Privileges – Introducing MySQL's Privilege System – Setting up a user for the web – Using the Right Database – Creating Database Tables.

Working with Your MySQL Database: SQL – Inserting Data into the Database – Retrieving Data from Database: Retrieving Data with Specific Criteria – Retrieving Data in a Particular order. – Updating Records in the database – Altering Tables after Creation – Deleting Records from the Database – Dropping Tables – Dropping the whole Database.

Unit V **12 Hrs**

Accessing Your MySQL Database from the web with PHP: How web Database Architectures work – Querying a Database from the web.

Using Session Control in PHP: Session Control – Understanding Basic session Functionality – Implementing simple sessions – Creating a session Example – Configuring Session Control – Implementing Authentication with session.

Interacting with the File System and the Server: Uploading files.

Text Book

1. Luke Welling, Laura Thomson, ***PHP and MySQL Web Development*** – Fourth Edition (2010) by Pearson Education.

Unit I - Chapter 1 (Page number 13 to 56)
Unit II - Chapter 3 (Page number 81 to 88)
Chapter 4 (Page number 107 to 120)
Chapter 21 (Page number 469 to 480)
Unit III - Chapter 5 (Page number 133 to 141, 143 to 156)
Unit IV - Chapter 9 (Page number 222 to 229)
Chapter 10 (Page number 243 to 248, 255 to 264)
Unit V - Chapter 11 (Page number 267 to 276)
Chapter 23 (Page number 509 to 517)
Chapter 19 (Page number 431 to 438)

Reference Books

1. Vikram Vaswani, ***A Beginner"s Guide PHP,*** Tata Mcgraw Hill Education Private Limited, 2009.
2. Larry Ullman, ***PHP 6 and MySQL 5,*** Pearson Education, 2008.

Core 4 - Software Engineering

Contact Hours per Week: 3 Hrs
Contact Hours per Semester: 36 Hrs
Credits: 3 **Subject code: P20CAC14**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to
CO 1: Understand and demonstrate basic knowledge in software engineering.
CO 2: Understand various life cycle models of software engineering.
CO 3: Be familiar with the concepts such as software project management techniques and requirements analysis and specification.
CO 4: Design & develop the software projects.
CO 5: Apply testing principles on software project and understand the maintenance concepts.

Unit I **7 Hrs**

Introduction: Evolution-From an Art form to an Engineering Discipline-Software Development Projects- Emergence of Software Engineering-Computer System Engineering.
Software Life Cycle Models: Waterfall Model and its Extensions-Rapid Application Development (RAD) – Agile Development Models-Spiral Model-A Comparison of Different Life Cycle Model

Unit II **7 Hrs**

Software Project Management: Responsibilities of a Software Project Manager-Project Planning-Metrics for Project Size Estimation-Project Estimation Techniques-Empirical Estimation Techniques-COCOMO.
Requirements Analysis and Specification: Requirements Gathering and Analysis-Software Requirements Specification (SRS)-Formal System Specification

Unit III **7 Hrs**

Software Design: Overview of the Design Process-Cohesion and Coupling-Layered Arrangement of Modules.
Function-Oriented Software Design: Structured Analysis-Developing the DFD Model of a System-Structured Design.

Unit IV **7 Hrs**

Object Modeling Using UML: UML Diagrams-Use Case Model-Class Diagrams-Interaction Diagrams-Activity Diagrams-State Chart Diagrams.
Software Reuse: Basic Issues in any Reuse Program-A Reuse Approach-Reuse at Organization Level.

Unit V **8 Hrs**

Coding and Testing: Coding-Code Review-Software Documentation-Testing-Unit Testing – Black-Box Testing-White-Box Testing-Debugging-Integration Testing –System Testing.

Software Maintenance: Characteristics of Software Maintenance-Software Reverse Engineering-Software Maintenance Process Models-Estimation of Maintenance Cost

Text Book:

Rajib Mall, ***Fundamentals of Software Enginerring.*** PHI Publication; Fourth Edition, 2016.

Unit I : Chapter- 1 (1.1, 1.2, 1.4, 1.6), 2 (2.2 to 2.6)
Unit II : Chapter -3 (3.2 to 3.7), 4 (4.1 to 4.3)
Unit III: Chapter -5 (5.1, 5.3, 5.4), 6 (6.2, 6.3, 6.4)
Unit IV: Chapter -7 (7.3 to 7.8), 14 (14.3, 14.4, 14.5)
Unit V : Chapter – 10(10.1 to 10.8, 10.10, 10.12), 13

Reference Books:

1. Roger S. Pressman**,** ***Software Engineering: A Practitioner's Approach***, McGrawHill, Seventh Edition.2010.
2. Sommerville, ***Software Engineering***, Addison Wesley-Longman; Sixth Edition.2004.

Elective I - Operating System

Contact Hours per Week: 5 Hrs
Contact Hours per Semester: 60 Hrs
Credits: 5 **Subject code: P20CAE11**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to

CO1: Get an introduction about Operating System and Process Management concepts.
CO2: Learn about Asynchronous Concurrent Processes and Concurrent Programming.
CO3: Learn about Deadlock situations and precautions, Real Storage Management in System.
CO4: Learn Virtual Storage Organization and its Management Strategies.
CO5: Learn about Processor Scheduling algorithms and Disk Scheduling algorithms in detail.

Unit I: **12 Hrs**

Operating Systems: Introduction – What is an Operating System – Computer Organization – Evolution of Operating Systems – Types of Operating Systems – Operating System Services – Operating System Operations – Concepts of Operating Systems – User Operating-System Interface – System Calls – System Programs - System Structure – Virtual Machines.
Process Management: Introduction – Basic Concepts – Process Scheduling – Operations on Processes – Overview of Interprocess Communication.

Unit II: **12 Hrs**

Scheduling: Introduction – Scheduling Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling – Real-time Scheduling – Algorithm Evaluation.
Interprocess Communication: Introduction – Race Conditions – Critical Section – Hardware Solution – Semaphores – Classical IPC Problems – Event Counters – Monitors – Message Passing.

Unit III: **12 Hrs**

Deadlock: Introduction – Deadlock Problem – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Detection of Deadlock – Deadlock Recovery.

Memory Management: Introduction – Background – Memory Management Strategies – Contiguous Memory Allocation – Noncontiguous Memory Allocation – Swapping.

Unit IV: **12 Hrs**

Virtual Memory: Introduction – Concept – Demand Paging – Process creation – Page Replacement – Allocation of Frames – Thrashing.

Input Output Management: Introduction – Principles of I/O Hardware – Principles of I/O Software – I/O Software Layers.

Disks: Introduction – Magnetic Disk – Disk Arm Scheduling Algorithms – Disk Formatting – Error Handling – Swap Space Management – RAID.

Unit V: **12 Hrs**

File Systems: Introduction – Files – Directories – File-System Mounting.

File System Implementation: Introduction – File System Structure – Implementing Files – Implementing Directories – Shared Files – Disk Space Management – File System Performance – File System Reliability – Log-Structured File System.

Case Study: Windows 2000: Introduction – Structure of Windows 2000 – Process and Thread Management in Windows – Memory Management – File System – I/O Management in Windows 2000.

Text Book:

Rohit Khurana, Operating System, Vikas Publishing House Pvt. Ltd, 1th Edition 2013.

Unit I : Chapter 1, 2
Unit II : Chapter 4, 5
Unit III : Chapter 6, 7
Unit IV : Chapter 8, 9, 10
Unit V : Chapter 11, 12, 16

Reference Book:

Silberschatz, Galvin, Gagne, Operating System Concepts, Wiley India Pvt Ltd., 2012.

Elective I – Computer Graphics

Contact Hours per Week: 5 Hrs
Contact Hours per Semester: 60 Hrs
Credits: 5 **Subject code: P20CAE12**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to
CO 1: Know about the basic concepts of computer graphics
CO 2: Learn about various input, output and display devices
CO 3: Learn various algorithms for drawing line, circle, and ellipse
CO 4: Gain knowledge in 2D and 3D Transformations
CO 5: Know about color models

Unit I **12 Hrs**

Introduction to Computer Graphics: Introduction-Non interactive/Interactive Graphics-Uses of Computer Graphics-Classification of Applications-Programming Language, Graphics and Operating Software-Graphic Systems Configuration.

Graphics Systems: Introduction – Cathode Ray Tube (CRT) Basics-Refresh Display-Direct View Storage Tube(DVST) –Raster Display-Input Devices-Output Devices-Computer Graphics Software- Integration of Graphics Standard-Interactive Graphics Techniques-Graphical User Interface(GUI).

Unit II **12 Hrs**

Output Primitives: Introduction-Representing Image-Straight Line-Line Drawing Algorithms-Differential Digital Analyser(DDA) Algorithm-Bresenham's Line Algorithm-Circle-Generating Algorithm-Bresenham's Circle Algorithm-Midpoint Circle Algorithm-Ellipse-Generating Algorithm-Midpoint Ellipse Algorithm-Polygon Filling Algorithm-Character or Text Generation-Aliasing and Antialising.

Unit III **12 Hrs**

Two-Dimensional Transformations: Introduction-Representation of Points- Matrix Algebra and Transformation-Transformation of Points-Transformation of Straight Line-Midpoint Transformation-Transformation of Parallel Lines-Transformation of Intersecting Lines-Rotation,Reflection and Scaling of Straight Line or Polygons-Combined Transformation-Translation and Homogeneous Coordinates-Rotation about an Arbitrary Point-Reflection about an Arbitrary Line.

Unit IV **12 Hrs**

Windowing and Clipping: Introduction – Viewing Transformation-Clipping-Point Clipping-Line Clipping –Cohen-Sutherland Line Clipping-Parametric Liang- Barsky 2D Line Clipping Algorithm-Polygon Clipping-Sutherland- Hodgman Algorithm- Curve Clipping- Text Clipping.

Unit V **12 Hrs**

3D Concepts and Techniques: Introduction-3D Transformation-Projection-Orthographic Projection-Isometric Projection-Oblique Projection-Perspective Projection.

Animation: Introduction-Devices for Producing Animation-Computer-Assisted Animation-Video Formats-Frame-by-Frame Animation Techniques-Real-Time Animation Techniques-Animation Software.

Text Book:

Amarendra N Sinha and Arun D Udai, ***"Computer Graphics",*** Tata McGraw Hill Education Private Linited, New Delhi, Fifth Reprint 2011.

Unit I - Chapter 1,2
Unit II - Chapter 3
Unit III - Chapter 4
Unit IV - Chapter 5
Unit V - Chapter 7 (7.1,7.2,7.7,7.8,7.9,7.10,7.11) , 15

Reference Books:

1. Donald Hearn, M. Pauline Baker, ***"Computer Graphics C Version"*****,** Second Edition, Pearson Education, Eighth Impression,2009.

2. V. K.Pachghare, ***"Computer Graphics"***, Second Edition,Laxmi Publications(P) LTD, New Delhi,2007.

Elective I - Distributed Operating Systems

Contact Hours per Week: 5 Hrs
Contact Hours per Semester: 60 Hrs
Credits: 5 **Subject code: P20CAE13**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to

CO1: Get an introduction about Distributed computing systems and issues involved in Designing distributed operating systems.

CO2: Describe the various communication techniques used for exchange of information among the processes of a distributed computing system and issues involved in designing of inter process communications.

CO3: Learn message passing and distributed shared memory mechanism in distributed operating systems.

CO4: Learn synchronization issues such as Mutual exclusion, Deadlock and Election algorithms

CO5: Learn commonly used approaches for resource management in distributed operating systems.

CO6: Learn process management issues and process migration mechanisms and mechanisms to support thread facility.

Unit I: **12 Hrs**

Fundamentals: What Is a Distributed Computing System? – Evolution of Distributed Computing Systems – Distributed Computing System Models – Why Are Distributed Computing Systems Gaining Popularity? – What Is a Distributed Operating System? – Issues in Designing a Distributed Operating System – Introduction to Distributed Computing Environment (DCE).

Unit II: **12 Hrs**

Message Passing: Introduction – Desirable Features of a Good Message – Passing System – Issues in IPC by Message Passing – Synchronization – Buffering – Multidatagram Messages – Encoding and Decoding of Message Data – Process Addressing – Failure Handling – Group Communication.

Unit III: **12 Hrs**

Remote Procedure Calls: Introduction – The RPC Model – Transparency of RPC – Implementing RPC Mechanism – Stub Generation – RPC Messages – Marshalling Arguments and Results – Server Management.

Distributed Shared Memory: Introduction – General Architecture of DSM Systems – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory Space.

Unit IV: **12 Hrs**

Synchronization: Mutual Exclusion – Deadlock – Election Algorithms.

Resource Management: Load-Balancing Approach – Load-Sharing Approach.

Unit V: **12 Hrs**

Process Managemet: Introduction – Process Migration – Threads.

Distributed File Systems: Introduction – Desirable Features of a Good Distributed File System – File Models – File-Accessing Models – File-Sharing Semantics – File-Caching Schemes –File Replication – Fault Tolerance.

Text Book:

1. Pradeep K.Sinha, ***Distributed Operating Systems Concepts and Design,*** PHI Private Limited, 2014.

Unit I : Chapter 1.1 – 1.8
Unit II : Chapter 3.1 – 3.10
Unit III : Chapter 4.1 – 4.8, 5.1 – 5.5
Unit IV : Chapter 6.4 – 6.6, 7.4, 7.5
Unit V : Chapter 8.1 – 8.3, 9.1 – 9.8

Reference Book:

1. Andrew S.Tannenbaum, ***Distributed Operating Systems,*** Pearson Education, 2001.

Core 5 Lab - Java Programming Lab

Contact Hours per Week: 5 Hrs
Contact Hours per Semester: 60 Hrs
Credits: 3 **Subject code: P20CAP11**

Course Outcomes :

Students, after successful completion of the course ,will be able to

CO 1 : Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
CO 2: Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
CO 3: Demonstrate how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
CO 4: Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

List of Programme:

1. Sorting n numbers using command-line arguments.
2. Implement programs using selection statements.
3. Implement program using Iteration statements.
4. To perform Matrix Operations.
5. Program to implement method overloading.
6. Program to implement method overriding.
7. Program to use the Keyword 'SUPER'.
8. Program for pre-defined Exception.
9. Program for a User-Defined Exception.
10. Program to implement multilevel inheritance.

11. Program to use interface.
12. Program to implement user defined packages.
13. Program to implement the concept of Multithreading.
14. Program for String Manipulation
15. Program for Applet Animation

Core 6 Lab - Open Source Programming Lab

Contact Hours per Week: 5 Hrs

Contact Hours per Semester: 60 Hrs

Credits: 3 **Subject code: P20CAP12**

Course Outcomes:

Students, after successful completion of the course ,will be able to

CO1: Do simple programs in PHP

CO2: Perform MySQL Queries through PHP

CO3: Perform advanced PHP techniques such as File upload, sessions, and authentications.

List of Programme :

1. Write a PHP Program to Implement Operators and Decision Making Statements.
2. Write a PHP Program to Implement Iterations.
3. Write a PHP Program to Implement Arrays.
4. Write a PHP Program to Implement Functions.
5. Write a PHP Program to Perform String Operations.
6. Write a PHP Program to Implement 'include' and 'require' functions.
7. Write a PHP program to Copy from one file to another file
8. Perform the Following Operations in MySQL.
   (i) Create Database
   (ii) Drop Database
   (iii)Select Database
9. Perform the Following Operations in MySQL.
   (i) Create Tables
   (ii) Drop Tables
   (iii)Insert Query.
10. Perform the Following Operations in MySQL.
    (i) Select Query
    (ii) 'Where' Clause
    (iii)Update Query
11. Perform the Following Operations in MySQL.
    (i) Delete Query
    (ii) 'Like' Clause
    (iii)Sorting Results
12. Write a PHP Program to Connect MySQL Database to Display the Details of Particular Student.
13. Develop a Student Information System in PHP to allow View, Delete, Insert, Update the details of students.

14. Create a Login Module to Implement Sessions in PHP.
15. Create your own dynamic website using PHP and MySQL.

SEMESTER - II

Core 7 - Python Programming

Contact Hours per Week: 4 Hrs
Contact Hours per Semester: 48 Hrs
Credits: 4 **Subject code: P20CAC21**

Course Outcomes:

Students, after successful completion of the course ,will be able to

CO1: Understand the basic concepts such as datatypes, Operators, Control Statements in Python.

CO2: Understand Arrays, Strings, and Functions in Python

CO3: Understand Classes and Objects, Inheritance

CO4: Understand Exceptions, Date and Time functions in Python

CO5: Work on Database Connectivity in Python and Data Science using in Python

Unit – I **8 Hrs**

Introduction to Python: Python – Features of Python – Execution of a Python Program – Viewing the Byte Code – Flavors of Python – Python Virtual Machine (PVM) – Frozen Binaries – Memory Management in Python – Garbage Collection in Python.

Datatypes in Python: How Python Sees Variables – Datatypes in Python – Built-in datatypes – bool datatype – Sequences in Python - Sets – Literals in Python – Determining the datatype of a variable – What about characters – User-defined Datatypes – Constants in Python – Identifiers and Reserved words – Naming Conventions in Pythons.

Operators in Python: Operator – Arithmetic Operators – Using Python Interpreter as Calculator – Assignment Operators – Unary Minus Operator – Relational Operators – Logical Operators – Boolean Operators – Bitwise Operators – Membership Operators – Identity Operators – Operator Precedence and Associativity.

Unit – II **9 Hrs**

Control Statements: Control Statement – The if Statement – A word in Indentation – The if..else Statement – The if..elif..else Statement – The while Loop – The for Loop – Infinite Loops – Nested Loops – The else suite – The break statement – The Continue Statement.

Arrays in Python: Array – Advantages of Arrays – Creating an array – Importing the Array Module – Indexing and Slicing on Arrays – Processing the Arrays – Types of Arrays – Working with Arrays using numpy – Creating Arrays using array() – Creating Arrays using linspace – Creating Arrays using logspace – Creating Arrays using arange() function – Creating Arrays using zeros() and ones() Functions – Mathematical Operations on Arrays – Comparing Arrays – Aliasing the Arrays – Viewing and Copying Arrays.

Strings and Characters: Creating Strings – Length of a String – Indexing in Strings – Slicing the Strings – Repeating the Strings – Concatenation of Strings – Checking Membership – Comparing Strings – Removing Spaces from a String – Finding Sub Strings – Counting Substrings in a String – Strings are Immutable.

Unit-III **10 Hrs**

Functions: Difference between a Function and a Method – Defining a Function – Calling a Function – Returning Results from a Function – Returning Multiple Values from a Function – Functions are First Class Objects – Pass by Object Reference – Formal and Actual Arguments – Positional Arguments – Keyword Arguments – Default Arguments – Variable Length Arguments – Local and Global Variables – The Global Keyword – Passing a Group of Elements to a Function – Recursive Functions.
Classes and Objects: Creating a Class – The Self Variable – Constructor – Types of Variables – Namespaces – Types of Methods.

Unit-IV **10 Hrs**

Inheritance and Polymorphism: Constructors in Inheritance – Overriding Super Class Constructors and Methods – The Super() Method – Types of Inheritance – Method Resolution Order.
Exceptions: Errors in a Python Program – Exceptions – Exception Handling – Types of Exceptions – The Except Block – The assert Statement – User-Defined Exceptions – Logging the Exceptions.
Date and Time: The epoch – Date and Time Now – Combining Date and Time – Formatting Dates and Times – Finding Durations using 'timedelta' – Comparing Two Dates – Sorting Dates – Stopping Execution Temporarily – Knowing the Time taken by a Program – Working with Calendar Module.

Unit-V **11 Hrs**

Python's Database Connectivity: DBMS – Advantages of a DBMS over Files – Types of Databases used with Python – Installation of MySQL Database Software – Verifying the MySQL in the Windows Operating System – Installing MySQLdb Module – Verifying the MySQLdb Interface Installation – Working with MySQL Database Using MySQL from Python – Retrieving All Rows from a Table – Inserting Rows into a Table – Deleting Rows from a Table – Updating Rows from a Table – Creating Database Tables through Python – Installation of Oracle 11g – Verifying Oracle Installation in Windows Operating System – Installing Oracle Database Driver – Verifying the Driver Installation – Working with Oracle Database – Using Oracle Database from Python – Stored Procedures.
Data Science Using Python: Data Frame – Data Visualization.

Text Book:

Dr.R.Nageswara Rao, ***Core Python Programming,*** Dreamtech Press, 2nd Edition, 2018.

Unit I : Chapters 1 Page No. (1-15), 3(49-69),4(71-88)
Unit II : Chapters 6(117-138), 7(151-182), 8(207-221)
Unit III : Chapters 9(237-264),13(351-367)
Unit IV : Chapters 14(373-390), 16(421-439), 20(515-532)
Unit V : Chapters 24(649-697), 25

Reference Book:

Wesley j.chun, ***Core python programming*** - Pearson Education, 2001.

Core 8 - Relational Database Management System

Contact Hours per week: 4 Hrs
Contact Hour per Semester: 48 Hrs
Credits: 4 **Subject Code: P20CAC22**

COURSE OUTCOMES:
Students, after successful completion of the course ,will be able to
CO 1: Draw the ER diagram for enterprise applications
CO 2: Analyze the consequence of algebra in designing relational model and create database using query languages with constraints and security
CO 3: Normalize databases to reduce cost due to redundancy constraints
CO 4: Assess different types of scheduling and recovery techniques for concurrent transactions
CO 5: Validate the query evaluation plan and optimize to reduce memory complexity

UNIT I **10 Hrs**
Introduction: Purpose of Database Systems – View of Data – Database Languages - Database System Architecture – Database Users and Administrators.
Database Design and the E-R Model: Entity Relationship Model – Constraints – Entity Relationship Diagrams - Extended E-R Features: Specialization, Generalization

UNIT II **8 Hrs**
Introduction to the Relational Model - Structure of Relational Databases – Keys - Schema Diagrams – Relational Query Languages.
Formal Relational Query Languages: The Relational Algebra – The Tuple Relational Calculus – The Domain Relational Calculus

UNIT III **10 Hrs**
Introduction to SQL: Overview – SQL Data Definition – Basic Structure of SQL Queries – Additional Basic Operations - Set Operations – Null values - Aggregate Functions – Nested Subqueries.
Intermediate SQL: Join Expressions – Views – Transaction - Integrity Constraints – Authorization.
Advanced SQL: Functions and Procedures – Triggers.

UNIT IV **10 Hrs**
Relational Database Design: Atomic domains and First Normal Form – Decomposition using Functional Dependencies: Keys and Functional Dependencies – Boyce Codd Normal Form - Third Normal Form. Functional Dependency Theory – Decomposition using Multivalued Dependencies: Multivalued Dependencies – Fourth Normal Form.

UNIT V **10 Hrs**
Transactions: Transaction Concept – A Simple Transaction Model – Transaction Atomocity and Durability – Serializability.
Concurrency Control: Lock Based Protocols – Deadlock Handling – Time Stamp Based Protocols – Validation Based Protocols.

Recovery System: Failure Classification – Storage – Recovery and Atomicity – Recovery Algorithm.

Text Book:

Abraham Silberschatz, Henry F Korth, S. Sudharshan, ***"Database System Concepts"***, McGraw Hill, 6th Edition – 2016

Unit I : **Chapter 1** (1.2 – 1.4, 1.9, 1.12)
Chapter 7 (7.2, 7.3. 7.5, 7.8.1, 7.8.2)
Unit II : **Chapter 2**(2.1, 2.3 - 2.5)**,**
Chapter 6
Unit III: **Chapter 3** (3.1 – 3.8), **Chapter 4** (4.1 – 4.4, 4.6), **Chapter 5** (5.2, 5.3)
Unit IV: **Chapter 8** (8.2, 8.3.1, 8.3.2, 8.3.4, 8.4, 8.6.1, 8.6.2)
Unit V : **Chapter 14** (14.1, 14.2, 14.4, 14.6), **Chapter 15** (15.1, 15.2, 15.4, 15.5),
Chapter 16 (16.1 – 16.4)

Reference Books:

1. R. Elmasri, S.B. Navathe, ***"Fundamentals of Database Systems"***, Pearson Education / Addison Wesley, Sixth Edition, 2014.
2. Raghu Ramakrishnan, Johannes Gehrke, ***"Database Management Systems"***, McGraw Hill, Third Edition, 2004.

Core 9 - Data Communications and Networks

Contact Hours per week: 3 Hrs
Contact Hour per Semester: 36 Hrs
Credits: 3 **Subject Code: P20CAC23**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to
CO 1: Identify the role of each layer in computer networks and its protocols.
CO 2: Encode the data for transmission in wired and wireless medium
CO 3: Develop scheme for error detection and correction
CO 4: Select flow control algorithm at link to link level.
CO 5: Evaluate the performance of various routing algorithms.
CO 6: Analyze the flow control and congestion control algorithms for QoS at end to end level.
CO 7: Develop secure network applications for the specified requirement.

UNIT I **7 Hrs**

Introduction: Data Communications – Networks - Network Types – Internet History - Standards and Administration.
Network Models: TCP/IP Protocol Suite - The OSI Model.
Introduction to Physical Layer: Data and Signals – Digital Signals: Bit rate, Bit length – Transmission Impairment - Data rate limits: Noiseless Channel: Nyquist Bit rate, Noisy Channel: Shannon Capacity – Performance: Bandwidth, Throughput, Latency.

UNIT II **7 Hrs**

Digital Transmission: Digital to Digital Conversion: Line Coding, Block Coding – Analog to Digital Conversion - Transmission Modes.

Analog Transmission: Digital to Analog Conversion: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying – Analog to Analog Conversion.

Bandwidth Utilization: Multiplexing.

Transmission Media: Guided Media - Unguided Media:Wireless.

UNIT III **7 Hrs**

Switching: Introduction - Circuit switched Networks – Packet switching.

Introduction to Data Link Layer: Link Layer Addressing: Three types of Addresses, Address Resolution Protocol.

Error Detection and Correction: Introduction**:** Types of Errors – Block coding: Error Detection – Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder using Polynomials- Checksum: Concept.

Data Link Control: DLC Services - Data Link Layer Protocols.

UNIT IV **8 Hrs**

Media Access Control: Random Access - Controlled Access – Channelization.

Connecting Devices and Virtual LANs: Connecting Devices.

Introduction to Network Layer: Network Layer Services - Packet switching - IPV4 addresses

Unicast Routing: Routing algorithms.

UNIT V **8 Hrs**

Introduction to Transport Layer: Introduction: Transport Layer Services – Transport Layer Protocols.

Standard Client Server Protocols: World Wide Web and HTTP - FTP - Electronic Mail - Telnet - Domain Name System: Namespace, DNS in Internet.

Text Book:

Behrouz A. Foruzan, ***"Data communication and Networking"***, Tata McGraw-Hill, Fifth Edition, 2016.

Unit I **Chapter 1** (1.1 to 1.5)
Chapter 2 (2.2, 2.3)
Chapter 3 (3.1, 3.3.1, 3.3.2, 3.4, 3.5.1, 3.5.2, 3.6.1, 3.6.2, 3.6.3)

Unit II **Chapter 4** (4.1.1, 4.1.3, 4.2, 4.3)
Chapter 5 (5.1.2 to 5.1.4, 5.2)
Chapter 6 (6.1)
Chapter 7 (7.2, 7.3)

Unit III **Chapter 8** (8.1 to 8.3)
Chapter 9 (9.2.1, 9.2.2)
Chapter 10 (10.1.1, 10.2.1, 10.3.1-10.3.3, 10.4.1)
Chapter 11 (11.1, 11.2)

Unit IV **Chapter 12** (12.1, 12.2, 12.3)
Chapter 17 (17.1)
Chapter 18 (18.1, 18.2, 18.4)

Chapter 20 (20.2)
Unit V **Chapter 23** (23.1.1, 23.2)
Chapter 26 (26.1 to 26.4, 26.6.1, 26.6.2)

Reference Books:

1.William Stallings, ***"Data and Computer Communication",*** Pearson Education, Sixth Edition, 2000.
2. Andrew S. Tannenbaum, ***"Computer Networks"***, Pearson Education, Fourth Edition, 2003.

Elective II - Mobile Computing

Contact Hours per week: 5 Hrs
Contact Hour per Semester: 60 Hrs
Credits: 5 **Subject Code: P20CAE21**

COURSE OUTCOMES:
Students, after successful completion of the course ,will be able to
CO1: Understand the concept of Mobile Computing and architecture of Mobile Communication.
CO2: Know about GSM.
CO3: Understand the latest technologies in Mobile Communications.
CO4: Understand the architecture of Wireless Communication.
CO5: Understand the Security Issues in Mobile Communications.

Unit I: **12 Hrs**

Introduction: Mobility of Bits And Bytes – Wireless-The Beginning - Mobile Computing - Networks - Middleware And Gateways - Applications And Services(Contents) - Standard Bodies.

Mobile Computing Architecture: Architecture For Mobile Computing - Three Tier Architecture.

Emerging Technologies: Bluetooth - Radio Frequency Identification (RFID) - Wireless Broadband (Wimax) - Mobile IP - Internet Protocol Version 6(IPv6).

Unit II: **12 Hrs**

Global System For Mobile Communications (GSM): Global For Mobile Communications - GSM Architecture - GSM Entities - Call Routing In GSM.

Short Message Service (SMS): Mobile Computing Over SMS – Short Message Service – Value Added Service Through SMS.

Unit III: **12 Hrs**

General Packet Radio Service: Introduction – GPRS and Packet Data Network - GPRS Network Architecture - GPRS Network Operations - Data Services in GPRS - Applications for GPRS – Limitations for GPRS.

Wireless Application Protocol (WAP): Introduction – WAP – MMS – GPRS Application.

CDMA AND 3G: Third Generation Networks – Applications on 3G.

Unit IV: **12 Hrs**

Wireless LAN: Wireless LAN Advantages - IEEE 802.11 Standards - Wireless LAN Architecture.

Client Programming: Introduction - Moving Beyond The Desktop - A Peek Under The Hood: Hardware Overview - Mobile Phones – Features of Mobile Phones – PDA - Design Constraints In Applications For Handle Held Devices.

Unit V: **12 Hrs**

IP Multimedia Subsystem: Introduction – IMS and its Evolution – Benefits from IMS – Architecture of IMS Networks – Protocols used in IMS.

Security Issues in Mobile Computing: Introduction-Information Security - Security Techniques and Algorithms - Security Protocols - Public Key Infrastructure.

Text Book:

Asoke.K.Talukder, Roopa.R.Yavagal, Hasan Ahmed, ***Mobile Computing Technology, Applications and Service Creation,*** Tata McGraw Hill Publishing Company, Second Edition, Twelth Reprint, 2018.

Unit I - Chapter 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.11, 2.4, 2.5, 4.2, 4.3, 4.4, 4.5, 4.6
Unit II - Chapter 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3
Unit III - Chapter 7.1 to 7.7, 8.1 to 8.4, 9.6, 9.7
Unit IV - Chapter 10.2, 10.3, 10.4 12.1 to 12.7
Unit V - Chapter 19.1 to 19.5, 20.1 to 20.5

Reference Books:

1) Asoke.K. Talukder, Roopa. R.Yavagal, ***Mobile Computing Technology, Applications and Service Creation,*** Tata McGraw Hill Publishing Company – 2009.
2) Kumkum Garg, ***Mobile Computing Theory and Practice,*** Pearson Education 2010
3) Sipra Dasbit, Biplab K. Sikdar, ***Mobile computing***, PHI Learning – 2009 – Eastern Economy Edition.
4) Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, ***Principles Of Mobile Computing,*** Second Edition – Springer (India) Private Limited – Seventh Indian Reprint 2008.

Elective II – Data Mining

Contact Hours per week: 5 Hrs
Contact Hour per Semester: 60 Hrs
Credits: 5 **Subject Code: P20CAE22**

Course Outcomes:

Students, after successful completion of the course ,will be able

CO1: To understand the Data Mining Concepts and Techniques.
CO2: To know about Clustering and Classification algorithms.
CO3: To understand Association rules and web mining.
CO4: To understand the spatial and temporal mining
CO5: To understand the Data Warehouse and its Trends.

Unit I **12 Hrs**

Introduction : Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery in Database - Data Mining Issues - Data Mining Metrics – Social Implications of Data Mining - Data Mining from a Database Perspective
Related Concepts: Database/OLTP systems – Fuzzy sets and Fuzzy Logic – Information Retrieval – Decision Support Systems – Dimensional Modeling – Data Warehousing – OLAP – Web Search Engines – Statistics – Machine Learning – Pattern Matching
Data Mining Techniques: Introduction – A Statistical Perceptive on Data Mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithm

Unit II **12 Hrs**

Classification: Introduction – Statistical-based Algorithms – Distance-based Algorithms – Decision Tree based Algorithms - Neural Network-based Algorithms – Rule-based Algorithms – Combining Techniques
Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms – Partitional Algorithms – Clustering Large Databases – Clustering with Categorical Attributes - Comparison.

Unit III **12 hrs**

Association Rules: Introduction – Large Itemsets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rule Techniques – Measuring the Quality of Rules
Web Mining: Introduction – Web Content Mining – Web Structure Mining – Web Usage Mining

Unit IV **12 hrs**

Spatial Mining: Introduction – Spatial Data Overview - Spatial Data Mining Primitives – Generalization and Specialization - Spatial Rules - Spatial Classification Algorithms - Spatial Clustering Algorithms
Temporal Mining: Introduction – Modeling Temporal Events – Time Series – Pattern Detection – Sequences – Temporal Association Rules.

Unit V **12 hrs**

Data Warehouse: The Building Blocks: Defining Features – Data Warehouse and Data Marts – Architectural Types – Overview of the Components – Metadata in the Data Warehouse
Trends in Data Warehousing: Continued Growth in Data Warehousing – Significant Trends – Emergence of Standards – Web-enabled Data Warehouse

Text Books:

1. Margaret H. Dunham, 8th Impression, ***Data Mining Introductory and Advanced Topics,*** Pearson Publications, 2013

Unit I - Chapters 1, 2, 3
Unit II - Chapters 4, 5
Unit III - Chapters 6, 7
Unit IV - Chapter 8, 9

2. Paulraj Ponniah, ***Data Warehousing Fundamentals for IT Professional,*** 2nd Edition, Wiley Publication, 2015

Unit V - Chapter 2, 3

Reference Book:

1. Jiawei Han, Micheline Kamber, ***Data Mining Concepts and Techniques,*** 2nd Edition, Morgan Kaufmann Publisher, New Delhi, 2007

Elective II – Cloud Computing

Contact Hours per week: 5 Hrs
Contact Hour per Semester: 60 Hrs
Credits: 5 **Subject Code: P20CAE23**

Course Outcomes:

Students, after successful completion of the course ,will be able to

CO1: Understand cloud computing architecture, deployment models and services
CO2: Implement virtualization in cloud.
CO3: Gain knowledge about program models and software development
CO4: Illustrate networking and open source for cloud
CO5: Know security and future of cloud computing

Unit I **12 hrs**

Cloud Computing Fundamentals: Motivation for Cloud Computing - Defining Cloud Computing - 5-4-3 Principles of Cloud computing - Cloud Ecosystem - Requirements for Cloud Services - Cloud Application - Benefits and Drawbacks.

Cloud Computing Architecture and Management: Cloud Architecture - Anatomy of the Cloud - Network Connectivity in Cloud Computing - Applications on the Cloud - Managing the Cloud - Migrating Application to Cloud.

Cloud Deployment Models: Introduction – Private Cloud - Public Cloud - Community Cloud - Hybrid Cloud.

Cloud Service Models: Introduction – Infrastructure as a Service -Platform as a Service - Software as a Service - Other Cloud Service Models.

Unit II **12 hrs**

Technological Drivers for Cloud Computing: SOA and Cloud – Virtualization - Multicore Technology - Memory and Storage Technologies - Networking Technologies - Web 3.0 - Programming Models.

Virtualization: Introduction – Virtualization Opportunities - Approaches to Virtualization – Hypervisors - From Virtualization to Cloud Computing.

Unit III **13 hrs**

Programming Models for Cloud Computing: Extended Programming Models for Cloud - New Programming Models Proposed for Cloud.

Software Development in Cloud: Introduction - Different Perspectives on SaaS Development - New Challenges - Cloud-Aware Software Development Using PaaS Technology.

Unit IV **12 hrs**

Networking for Cloud Computing: Introduction – Overview of Data Center Environment - Networking Issues in Data Centers - Transport Layer Issues in DCNs - TCP Enhancements for DCNs.
Cloud Service Providers: – EMC – Google - Amazon Web Services – Microsoft.
Open Source Support for Cloud: Introduction - Open Source Tools for IaaS - Open Source Tools for PaaS - Open Source Tools for SaaS .

Unit V **11 hrs**

Security in Cloud Computing: Introduction - Security Aspects - Platform-Related Security - Audit and Compliance.
Advanced Concepts in Cloud Computing: – Intercloud - Cloud Management - Mobile Cloud - Media Cloud - Interoperability and Standards - Cloud Governance - Computational Intelligence in Cloud - Green Cloud - Cloud Analytics.

Text Book:

K.Chandrasekaran, ***Essentials of Cloud Computing,*** CRC Press, 2015.

Unit I	:	Chapter 2, 3, 4, 5
Unit II	:	Chapter 6 (6.1 to 6.6, 6.8, 6.10), 7
Unit III	:	Chapter 8, 9
Unit IV	:	Chapter 10, 11(11.1 – 11.5), 12
Unit V	:	Chapter 13, 14.

Reference Books:

1. V.K.Pachghare, ***Cloud Computing***, PHI Learning Private Limited, 2016
2. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, ***Cloud Computing by A Practical Approach,*** Tata McGraw-Hill Education Private Limited, New Delhi, 2010 Edition, Fifth Reprint 2011.

NME - Internet and Web Designing

Contact Hours per Week : 4
Contact Hours per Semester: 48 Hrs
Credits : 4 **Subject Code: P20CAN21**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to
CO 1: Understand the basic concepts of Internet and WWW.
CO 2: Design web pages using HTML Basic Tags and understand the various sections.
CO 3: Understand how to insert ordered and unordered lists within a web page.
CO 4: Understand how to insert link and table within a web page.
CO 5: Understand how to insert frames and forms within a web page.

Unit I **10 Hrs**

Introduction to the Internet: Networking- Internet-Electronic Mail-World Wide Web-Usenet-Telnet.

Introduction to HTML: Designing a Home Page-History of HTML- HTML generations & documents – anchor tag – hyperlinks.

Unit II **10 Hrs**

Head and Body Sections: Header section – Title – Prologue –Links- Colorful web page – Comment lines.

Designing the body section: Heading printing – aligning the headings – horizontal rule - paragraph – tab settings – images and pictures – embedding PNG format images.

Unit III **10 Hrs**

Ordered and Unordered lists: Lists – Unordered list- Headings in a list – Ordered list – Nested lists.

Table handling: Tables – Table creation in HTML – Width of the table and cells – Cells spanning multiple rows/columns – Coloring cells – Column specification.

Unit IV **9 Hrs**

Frames: Frameset definition- Frame definition – Nested framesets.

Unit V **9 Hrs**

Forms: Action, method and enctype attribute- drop down list- sample forms.

Text Book:

C.Xavier, ***World wide web design with HTML.*** Tata McGraw Hill Education Private Limited, 2014

Unit I : Chapter- 1, 4
Unit II: Chapter -5, 6
Unit III: Chapter -7, 8
Unit IV: Chapter -10
Unit V : Chapter – 12

Reference Book:

Ivan Bayross. ***Web enabled commercial Application Development using HTML, JavaScript, DHTML and PHP***, BPB Publications; Fourth Revised Edition.2013.

Core 10 Lab – Python Programming Lab

Contact Hours per Week: 5 Hrs
Contact Hours per Semester: 60 Hrs
Credits: 3 **Subject code: P20CAP21**

Course Outcomes:

Students, after successful completion of the course ,will be able to

CO 1: Create programs using the basic concepts such as data types, Control Statements in Python.
CO 2: Create programs using the concepts such as Arrays, Strings, and Functions in Python.
CO 3: Create programs using the concepts such as Classes and Objects, Inheritance

CO 4: Create programs using Exceptions, Database Connectivity in Python.

List of Programmes:

1. A Python Program to Implement 'Basic Data types'.
2. A Python Program to Implement 'List'.
3. A Python Program to Implement 'Tuples'.
4. A Python Program to Implement 'Range'.
5. A Python Program to Implement 'Control Statements'.
6. A Python Program to Implement 'if..else Statement'.
7. A Python Program to Implement 'Arrays'.
8. A Python Program to Implement 'Strings and Characters'.
9. A Python Program to Implement 'Functions'.
10. A Python Program to Implement 'Classes and Objects'.
11. A Python Program to Implement 'Inheritance and Polymorphism'.
12. A Python Program to Implement 'Exceptions'.
13. A Python Program to Implement 'Date and Time'.
14. A Python Program to Implement 'Python's Database Connectivity' using Oracle.
15. A Python Program to Implement 'Python's Database Connectivity' using MySQL.

Core 11 Lab – Relational Database Management System Lab

Contact Hours per Week: 5 Hrs
Contact Hours per Semester: 60 Hrs
Credits: 3 **Subject code: P20CAP22**

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to

CO 1: Populate and query a database using SQL DML/DDL commands

CO 2: Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS

CO 3: Do Programmes on PL/SQL including stored procedures, stored functions, cursors and packages

CO 4: Design and build a GUI application using any programming language as front end

List of Programmes:

1. Data Definition Language Commands
2. Data Manipulation Language Commands
3. Data Control Language, Nested Queries
4. Set Operators and Join Queries
5. Views and Indexes
6. PL/SQL – Triggers
7. PL/SQL – Procedures
8. PL/SQL – Procedures
9. Front end Connectivity
10. Form Design
11. Report Generation

Program Name : Master of Computer Applications
Discipline : Computer Applications
(For those who join in June 2020 and after)

VALUE ADDED COURSES (PG Only)

Course Name	Internal Mark = Total Mark	Subject Code
Data Structure	100=100	V1CA7
Computer Algorithms	100=100	V1CA8
System Software	100=100	V1CA9

Value Added Course: Data Structure (PG Only)

Contact Hours per Semester: 30 Hrs **Subject Code:** V1CA7

Course outcomes:
Students, after successful completion of the course ,will be able to
CO1: Learn about concepts of Data Structures and Arrays.
CO2: Understand on Linked Lists, Stacks and its Operations.
CO3: Learn about Queues, Tables concepts, types and its Operations.
CO4: Learn more about concepts of trees, representations, operations and types of trees.
CO5: Learn about Graphs terminologies, Representations, Operations and Applications of Trees.

Unit I: **6 HRS**
Introduction and Overview: Concept of Data Structures – Overview of Data Structures.
Arrays: Definition – Terminology – One-dimensional Arrays – Multidimensional Arrays.

Unit II: **6 HRS**
Linked Lists: Definition – Single Linked List – Circular Linked List – Double Linked List – Circular Double Linked Lists.
Stacks: Introduction – Definition – Representation of Stack – Operations on Stacks.

Unit III: **6 HRS**
Queues: Introduction – Definition – Representation of Queues – Various Queue Structures.
Tables: Rectangular Tables – Jagged Tables – Inverted Tables – Hash Tables.

Unit IV: **6 HRS**
Trees: Basic Terminologies – Definition and Concepts – Representation of Binary Tree – Operations on Binary Tree – Types of Binary Trees: Expression Tree – Binary Search Tree – Heap Trees.

Unit V: **6 HRS**
Graphs: Introduction – Graph Terminologies – Representation of Graphs – Operations on Graphs – Applications of Graph Structures: Shortest Path Problem – Minimum Spanning Tree.

Text Book:

D.Samanta, Classic Data Structures, Prentice-Hall of India, 2008.

Unit I : Chapter 1.2, 1.3, Chapter 2.1 – 2.4
Unit II : Chapter 3.1 – 3.5, Chapter 4.1 – 4.4
Unit III : Chapter 5.1 – 5.4, Chapter 6.1 – 6.4 (6.4.1 – 6.4.4)
Unit IV : Chapter 7.1 – 7.5 (7.5.1 – 7.5.3)
Unit V : Chapter 8.1 – 8.5 (8.5.1, 8.5.3)

Reference Book:

Brijendra Kumar Joshi, Data Structures and Algorithms in C++, Tata McGraw Hill Education, 2010.

Value Added Course: Computer Algorithms (PG Only)

Contact Hour per Semester: 30 Hrs **Subject Code:** V1CA8

COURSE OUTCOMES:

Students, after successful completion of the course ,will be able to

CO1: Understand the basic concepts of Algorithms.
CO2: Gain knowledge about data structures,
CO3: Gain knowledge about the Sorting techniques.
CO4: Understand the concepts of trees.
CO5: Gain knowledge about the backtracking techniques.

Unit I: **6 Hrs**

Introduction: What is an Algorithm? – Algorithm Specification – Performance Analysis – Randomized Algorithms.

Unit II: **6 Hrs**

Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Graphs.

Unit III: **6 Hrs**

Divide and Conquer: Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection

Unit IV: **6 Hrs**

The Greedy Method: The General Method – Container Loading – Knapsack Problem – Minimum-Cost Spanning Trees.

Unit V: **6 Hrs**

Backtracking: The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamilton Cycles – Knapsack Problem.

Text Book:

1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, ***Fundamentals of Computer Algorithms,*** University Press Private Limited, Second Edition, Reprint, 2008.

Unit I - Chapter 1.1, 1.2, 1.3, 1.4.
Unit II - Chapter 2.1, 2.2, 2.3, 2.4, 2.6.
Unit III - Chapter 3.3, 3.4, 3.5, 3.6, 3.7
Unit IV - Chapter 4.1 to 4.3, 4.6
Unit V - Chapter 7.2 to 7.6

Reference Books:

1) Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, ***Introduction to Algorithms,*** McGraw Hill Book Company, Second Edition, Fourth Printing, 2003.
2) Jon Kleinberg, Eva Tardos, ***Algorithm Design***, Pearson Education Inc, 2006

Value Added Course: System Software (PG Only)

Contact Hours per Semester : 30 hrs **Subject Code :** V1CA9

Course Outcomes:

Students, after successful completion of the course ,will be able to

CO1: Cover the design and implementation of various types of system utilities software.

CO2: Illustrate how the utility software interacts with operating system.

CO3: Understand the assembler functions

CO4: Know about loader and linkers functions

CO5: Know the working of macro processor and Compiler

Unit I **10 Hrs**

Background: Introduction-System software and Machine Architecture – The simplified instructional Computer – Traditional Machines (only VAX Architecture) – RISC Machines (only UltraSPARC Architecture).

Unit II **8 Hrs**

Assemblers: Basic Assembler Functions – Machine-Dependent Assembler Features (only Program Relocation) – Machine- Independent Assembler Features – Assembler Design Options.

Unit III **5 Hrs**

Loaders and Linkers: Basic Loader Functions – Machine-Dependent Loader Features - Loader Design Options.

Unit IV **4 Hrs**

Macro Processors: Basic Macro Processor Functions - Macro Processor Design Options.

Unit V **3 Hrs**

Compilers: Basic Compiler Functions – Compiler Design Options.

Text Book:

Leland L. Beck, D. Manjula, ***System Software,*** 3rd Edition, Pearson Education, 2009.

Unit I - Chapter 1 (1.2-1.4 (1.4.1), 1.5(1.5.1))

Unit II - Chapter 2 (2.1, 2.2(2.2.2), 2.3, 2.4)

Unit III - Chapter 3 (3.1, 3.2, 3.4)

Unit IV - Chapter 4 (4.1, 4.3)

Unit V - Chapter 5 (5.1, 5.4)

Reference Book:

J. Nithyashri, ***System Software,*** 2nd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.

Courses Name: Bachelor of Science
Discipline : Physical Education
(For those who Join in 2019 and after)

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
III	Language	TAMIL	6	3	25+75=100	U3PT3		
	English	ENGLISH	6	3	25+75=100	U3PE3		
	Core	Human Anatomy	4	4	25+75=100	U19PEC31		New
	Allied	Fundamentals of Test and Measurement in Physical Education	4	4	25+75=100	U19PEA31	Skill Development	New
	Elective	Health Education	4	3	25+75=100	U19PEE31	Focus on Health	
	Skill Based	Introduction to Yoga	2	2	25+75=100	U19PES31	Employability	
	Skill Based-Lab	Lab III Manual of Track and Field	4	2	100+0=100	U19PEP31	Acquiring Knowledge	New
	Core Practical	Lab IV Game of Specialization	3	-	-	-	Application of Techniques	New
	Allied Practical	Lab V Track & Field Events – II and Gymnastics	3	-	-	-	Skill Development	New
IV	Language	TAMIL	6	3	25+75=100	U3PT4		
	English	ENGLISH	6	3	25+75=100	U3PE4		
	Core	Theory of Games and Sports -I	6	5	25+75=100	U19PEC41	Skill Development	New
	Elective	Fitness and Wellness	4	3	25+75=100	U19PEE41		
	Core Practical	Lab IV Game of Specialization	5 (3+5)	4	40+60=100	U19PEP41	Skill Development	New
	Skill Based Practical	Lab V Introduction to Yoga	4	2	40+60=100	U19PEP42	Employability	New
	Allied Practical	Lab VI Track & Field Events – II and Gymnastics	5 (3+5)	4	40+60=100	U19PEP43	Enhance the Skills	
		Physical Education	-	1	-	U2PS4	Academic Aware	New

PART III

SEMESTER-III

CORE PAPER – II HUMAN ANATOMY

(For those admitted in June 2019 and later)

Contact hours per week: 4 Credits : 4

Contact hours per semester: 60 Subject Code: U19PEC31

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Understand the basic concept of Anatomy and Physiology

CO2: Know about structure and function of muscles and bones

CO3: Learn the structure and functions of heart and lungs

CO4: Know about the structure of brain and glands

CO5: Acquire knowledge about digestive and excretory systems.

UNIT I : INTRODUCTION (12 Hours)

Definition, Meaning and Scope of Human anatomy and physiology – Need and importance of Human Anatomy - Cell - Microscopic structure of cell - Tissue - Organ - Systems - Various systems in Human Body.

UNIT II MUSCULAR AND SKELETAL SYSTEMS (12 Hours)

Muscular System: Classification of muscles - Structure and functions of Skeletal muscle – Muscle fiber - Skeletal System: Bones - Structure and functions of bones - Classification of Bones - Joints: Definition - Classification of joints.

UNIT III: CARDIO RESPIRATORY SYSTEMS (12 Hours)

Cardio vascular system: Structure and functions of heart - Cardiac cycle - Cardiac output - Functions of blood – Respiratory Systems: Structure and functions of Lungs – Internal and external respiration – vital capacity – VO_2 max.

UNIT IV: NERVOUS AND ENDOCRINE SYSTEMS (12 Hours)

Nervous system: Structure and functions of Brain, Spinal cord, Neuron - Autonomic nervous system - central nervous system – Endocrine System: Structure and Functions of Glands (Pituitary, thyroid, adrenal glands)

UNIT IV: DIGESTIVE AND EXCRETORY SYSTEMS (12 Hours)

Digestive System: Types of energy resources - Gastro-intestinal system - structures - functions and its parts - Excretory system: Structure of kidney – skin and its functions .

TEXT BOOK

- Murugesh. N., (2006). Anatomy, Physiology and Health Education", First Edition, Sathya Publishers., Chennai.

REFERENCE BOOKS

1. Elaine N., 2010 "Essentials of Human Anatomy and Physiology", Pearson Education, River, New Jersey.
2. Albart. B., 2006 "Human Physiology", First Edition, Sports Publications, Chennai. Sivaramakrishnan. S., 2006 "Anatomy and Physiology for Physical Education" Friends Publication, Chennai.
3. Mishra, S.R., 2012, "Physiology of Sports and Exercise" Khel Sahitya Kendra, New Delhi
4. Mishra. S.C., 2005 "Physiology in Sports," First Edition, Sports Publication, New Delhi.

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III SEMESTER / Part III - ALLIED

FUNDAMENTALS OF TEST AND MEASUREMENT IN PHYSICAL EDUCATION

(For those admitted in June 2019 and later)

Contact hours per week:4 Credits:4

Contact hours per semester:60 Subject Code : U19PEA31

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Understand the concept of test and measurement
CO2: Obtain the procedure of physical fitness tests
CO3: Learn the procedure for measuring various sports skill tests
CO4: Acquire the procedure for identifying the sports performance
CO5: To discriminate the performance based on the fitness and skill tests score.

UNIT I: INTRODUCTION OF TEST AND MEASUREMENT (12 Hours)

Test and Measurement - Meaning – definition - Need and importance of test - Classification of test

UNIT II: PHYSICAL FITNESS TESTS (12 Hours)

Test for Speed, Agility, Flexibility, Strength, Cardio Vascular and muscular Endurance.

UNIT III: MOTOR FITNESS TEST: (12 Hours)

AAHPER Youth Fitness Test – JCR - Barrow Motor Ability Test - Step test (Harvard and Queen's College Test)

UNIT IV: SPORTS SKILL TESTS (i) (12 Hours)

French short serve Badminton test - Knox Basketball test - Schemithals French field Hockey test - Hewitt Swimming Achievement Scale (Men) - Sutcliffe cricket skill test.

UNIT IV: SPORTS SKILL TESTS (ii) (12 Hours)

AAHPER Football test - Cornish Handball test - AAHPER Volleyball test – Broer Miller Forehand - Backhand Drive test

TEXT BOOK

- Verma.H, 2013 "Test and Measurement in Physical Education", Sports Publications.

REFERENCE BOOKS

1. Krishnan, J., 2005 "Evaluation of Physical Education and Sports." First Edition, Sports Publication, New Delhi.
2. Srivastava.A.K., 2013 "Evaluation in Test and Measurement " Sports Publications, New Delhi.
3. Sharad.C., 2005 "Reading in Physical Education and Sports" First Edition, Sports Publications, New Delhi.
4. Veena., V., 2003 "Evaluation in Physical Education", First Edition, Sports Publications., New Delhi.

ELECTIVE - HEALTH EDUCATION

(For those admitted in June 2019 and later)

Contact hours per week: 4 Credits : 3

Contact hours per semester : 60 Subject Code : U19PEE31

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1: Understand the various dimensions of Health and Health Education

CO2: Acquire the knowledge of personal hygiene and mental health

CO3: Understand the causes of communicable and non-communicable diseases

CO4: Know about the family life education.

CO5: Get knowledge on safety education.

UNIT I : HEALTH EDUCATION (12 Hours)

Health: Meaning of health - brief description of physical - mental-emotional - social health - Physical fitness and Health related Physical fitness. Health education: Meaning of health education - need - scope – aims and Course Outcomes:.

UNIT I : HYGIENE AND NUTRITION (12 Hours)

Hygiene: Need and importance of personal hygiene - Environmental hygiene and food hygiene - associated practice related to maintenance and promotion of health Nutrition malnutrition - balanced diet - food alteration and its harmful effect on health. Mental health meaning – Mental health problems of college students.

UNIT III : ENVIRONMENTAL POLLUTION AND DISEASES (12 Hours)

Environmental pollution: Water - air-land -radiation noise pesticides. Communicable and non communicable diseases: Distinction between communicable and non communicable diseases

- communicable diseases - mode of spread and their preventions - Non-communicable diseases.

UNIT IV : FAMILY LIFE EDUCATION (12 Hours)

Family Life Education : Family as an institution - types of family - role of family members. Concept of marriage - significance of marriage - factors influencing marriage - getting married - love marriage - arranged marriage - adjustment in marriage

UNIT V SAFETY EDUCATION (12 Hours)

Safety Education: Importance of safety education - for preventing accidents and its general principles. Safety in physical education and sports: Principles of safety in playfields - equipments - dress.

TEXT BOOK

- Aneja, 2013," Health Education", Sports Publication, New Delhi.

REFERENCE BOOKS

1. Blank F.C. 2002, "Foods and Nutrition", Sixth Edition, Agrobios India Publication, Jodhpur.
2. Ramachandran.L, and T.J. Dharmalingam. 2010, "Health Education a New Approach," Vikas Publications, New Delhi.
3. NandaV.K, 2005, "Health Education," Second Edition, Nmol Publication, New Delhi. 4. Tiwari, S. Raman, Rathor and C. Lal., 2007 "Health Education", APH Publishing, New Delhi.
4. Nirmala, D.G., T. Krishnammal., and A. Nagalakshmi, 2007, "Physical Education and Health Education", First Edition, Priyakamal Pathipagam, Madurai.

INTRODUCTION TO YOGA

(For those admitted in June 2019 and later)

Contact hours per week : 2 Credits :2

Contact hours per semester: 30 Subject Code : U19PES31

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Understand the concept of yoga

CO2: Acquire the procedure of doing asana

CO3: Gain the knowledge about the procedure and physiology of bandhas and dristi

CO4: Know the procedure of Pranayama

CO5: Know the procedure of Dharana

UNIT I: YOGA **(6 Hours)**

Introduction - meaning - aim of yoga-types of yoga (Karma Yoga Gnana Yoga - Ashtanga yoga - Bhakti yoga - kundalini yoga - Hatha yoga - concepts and mis concepts about yoga.

UNIT II: ASANAS **(6 Hours)**

Suryanamasakar-Yogamudra- Padmasana- Vakrasana, Vajrasan - Ardha-matsyendrasan, - - Vipareetakarani - Bhujangasana - Sarvangasana - Dhanurasana - Shirsasana- Matsyasana - Mayurasana – ShalabasanaVrikshasana - Halasana - Tadasana - Patchimotanasana - Makarasana – Shavasana procedures.

UNIT III: KRIYAS **(6 Hours)**

Kriyas- Meaning- Types – Procedures – Benefits- contradications.

UNIT IV: PRANAYAMA **(6 Hours)**

Meaning of Pranayama – Types of Pranayama –Nadisudhi- Surya Bedhan- Ujjayi, Shitkari-Sheetali.

UNIT V: MEDITATION AND MUDRAS **(6 Hours)**

Meditation- meaning – Types- Om chant- benefits – Mudras – Meaning, types and benefits.

TEXT BOOK

- Iyenkar, B.K.S., 2005, "Light on Yoga" Thirty Second Editions, Harper Colling Publication, London.

REFERENCE BOOKS

1. Gore.C.S., 2011 "Yoga and Health", Sports Publications, New Delhi.
2. Pramanik.T.N., 2013, "Yoga for Healthy Body", Sports Publications, New Delhi.
3. Qureshi.S.S., 2013, "Yoga Cures Diabetes" Sports Publications, New Delhi,
4. Srivastava.A.K., 2010" Health and Yoga", Sports Publications, New Delhi.
5. Yeats, B., 2000, "How to Use Yoga" First Edition, Sports Publications, New Delhi.

MANUAL OF TRACK AND FIELD

(For those admitted in June 2019 and later)

Contact hours per week: 4 Credits :3

Contact hours per semester: 60 Subject Code : U19PEP31

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Be familiar with the procedure of track event markings .

CO2: Be familiar with the procedure of field event markings .

CO3: Be familiar with method of officiating in track events.

CO4: Acquire the knowledge on the method of officiating in field events

CO5: Know the scoring system of track and field events.

UNIT I: LAYOUT OF TRACK **(12 Hours)**

Types of track: Standard and Non standard - Planning and construction of 200 M and 400 M track.

UNIT II: MARKING OF TRACK EVENTS **(12 Hours)**

Marking of the starting lines - Finishing lines- Calculation of stagger - Calculation of diagonal excess - Relay marking - Hurdles Marking (100H, 110H and 400 M hurdles). Field Events - Jumps and Throws.

UNIT III: MARKING OF FIELD EVENTS **(12 Hours)**

Marking of circle, runway, landing area for field events (Jumps and Throws).

UNIT IV: OFFICIALS TO CONDUCT THE TRACK EVENTS **(12 Hours)**

Duties of the officials: Management officials - Competition director - Meet manager - Technical manager- Event presentation manager - Competition officials : Referees for the track events - Judges for track events - Track umpires - timekeepers - starters - re-callers - starter's assistants.

UNIT V: OFFICIALS TO CONDUCT THE FIELD EVENTS **(12 Hours)**

Referees of the field event (Jumps and Throws) - Judges for field event (Jumps and Throws) – Score sheet – tie-break in field events.

TEXTBOOK

- Valson, CK, 2014 "Competition Rules Hand Book". Athletic Federation of India, New Delhi

REFERENCE BOOKS

1. Bosen, K., 2006, "Athletics". First Edition, NIS Publication, Patiala
2. Loyd R. 2011 "Gymnastics Skills Techniques Training", The Crouched Press Publication, New Delhi
3. Narang.P., 2005, "Athletic Training", First Edition, Lakshay Publication, Chennai .
4. Sandhu, V., 2006, "Teaching & Coaching Athletics", First Edition, Sports' Publication, New Delhi.
5. Sharma.N.P., 2005, "Fundamentals of Track and Field", First Edition, Khel Sahitya Kendra, New Delhi.

SEMESTER IV

PART III – CORE THEORY

THEORY OF GAMES AND SPORTS –I

Contact hours per week: 6 Credits : 5

Contact hours per semester: 90 Subject Code : U19PEC41

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to understand about the

CO1: History of Ball Badminton, working Federations, fundamental skills and Techniques

CO2: History of Badminton, working Federations and fundamental skills and Techniques

CO3: History of Cricket, working Federations and fundamental skills and Techniques

CO4: History of Swimming, working Federations and fundamental skills and Techniques

UNIT I: HISTORY AND WORKING FEDERATIONS (15 Hours)

History - Working Federations - Major Tournaments – Ball Badminton, Badminton, Cricket and Swimming.

UNIT II: BALL BADMINTON (15 Hours)

Layout and maintenance of Ball Badminton Court - Equipment and specification - Basic rules of the game - Fundamental skills – Stroke and its Types – scoring system and officials.

UNIT III: BADMINTON (15 Hours)

Layout and maintenance of Badminton Court - Basic Rules of the game - Offensive stroke - Defensive stroke – Scoring system and officials.

UNIT IV: CRICKET (15 Hours)

Layout and maintenance of cricket oval - Equipments and its specification - Basic rules of the game - Fundamentals skills – Batting – Bowling – Fielding – Scoring system and officials.

UNIT V: SWIMMING (15 Hours)

Layout and maintenance of Swimming Pool- Long Course – Short Course - Rules and regulations of competitive swimming - Types of swimming Strokes – Scoring system and officials.

TEXT BOOK

- Thakur, J.K., 2013 "Measurement of Playing Field", Sports Publications, New Delhi.

REFERENCE BOOKS

1. Monika, A., 2005, "Ball Badminton", Sports Publications, First edition, New Delhi.
2. Monika, A., 2005, "Badminton", Sports Publications, First edition, New Delhi.

3. Monika, A., 2005, "cricket", Sports Publications, First edition, New Delhi
4. Monika, A., 2005, "swimming", Sports Publications, First edition, New Delhi.

ELECTIVE PAPER- FITNESS AND WELLNESS

(For those admitted in June 2019 and later)

Contact hours per week: 4 Credits :3

Contact hours per semester: 60 Subject Code : U19PEE41

OBJECTIVES:

Enable students to

1. Understand the essentials of lifelong wellness
2. Overcome fitness barriers and involve in physical movement pursuits
3. Learn and excel in Track and Field sports events

UNIT I – Awareness of Physical fitness and Wellness

Definition – Meaning – Concept of Fitness and Wellness – Need and importance of Fitness and Wellness.

UNIT II – Aging Process

Age of Automation – Technological developments – Healthy aging – Wellness – Sports as a hobby and de-stressing agent

UNIT III - Types of Fitness and Wellness

Chronological fitness – Physiological fitness - Functional fitness – Mental fitness

UNIT: IV Fitness and Sports

Social fitness – Sports and socialization – Performance related fitness

UNIT: V Access the Fitness

Tools to assess fitness – Spiritual fitness and wellness

BOOKS FOR REFERENCE:

1. Hoeger Werner W.K. and Hoeger Sharon A. **Fitness and Wellness**, Englewood:Morton publishing Company, 1990.

2. Hazedine, **Fitness for Sports**, Ramsburg: The Crowood Ress Ltd., 1985.

3. James and Leona Hart. **100% Fitness**, New Delhi: Goodwill Publishing House, 1983.
4. **Wellness-Concepts and applications** – David J. Anspaugh, Michael H. Hamrick and Frank D. Rosato II edition Masby publishing house – Chicago.1991.

LAB IV

CORE - GAME OF SPECIALIZATION

(For those admitted in June 2019 and later)

Contact hours per week : 3+5 Credits :4

Contact hours per semester : 45+75 Subject Code : U19PEP41

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Be familiar with techniques and tactics in Basketball and Kabaddi

CO2: Obtain the experience in advanced skill in Tennis and Volleyball

CO3: Obtain the tactical knowledge in advanced skill in Football and Handball

CO4: Understand the strategies in Hockey and Kho-Kho

GAME OF SPECIALIZATION

The students can choose any one of the following games: advance skills, strategy and playing ability

1. Basketball
2. Kabaddi
3. Tennis
4. Volleyball
5. Football
6. Handball
7. Hockey
8. Kho-Kho

TEXT BOOKS

- Bhari, B., 2010, "Layout of Play Field", Sports Publications, New Delhi.

REFERENCE BOOKS

1. Kirubakar, and S. Glady., 2009, "Tennis Skills: A Teacher's Guide", First edition, S.S.Publications, Chennai.
2. Monika, A., 2005, "Basketball", Sports Publications. First edition. New Delhi.
3. Monika, A, 2005, "Hockey Coaching Manual", Sports Publications, First edition New Delhi.
4. Monika, A., 2005, "Handball", Sports Publications, First edition, New Delhi.
5. Monika, A., 2005, "Volleyball", Sports Publications, First edition, New Delhi.
6. Monika, A., 2005, "Kabaddi", Sports Publications, First edition, New Delhi.
7. Birumal, 2006, "Football Techniques", Nis Publications, New Delhi
8. Monika, A, 2005, "Kho-Kho", Sports Publications, First edition New Delhi.

LAB V - INTRODUCTION TO YOGA

(For those admitted in June 2019 and later)

Contact hours per week:4 Credits:2

Contact hours per semester:60 Subject Code : U19PEP42

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Acquire practical knowledge on asanas

CO2: Obtain the experience in Bandhas, Kriyas and pranayama

LIST OF PRACTICALS IN YOGA

Asana I : Swastickasana - Padmasana - Vajrasona - Samasana – Bhuingusana- Dhanurasana - Matsyasana – Shalabasana.

Asana II : Halasana - Patchimotanasana - ardhamatsyendrasan - vipareetakarani - sarvangasana –

Asana III - mayurasana- vrikshansana - tadasasana - makarasana - vridshasana - shavasana

Kriyas: Bandhas and Kriyas- Jalaneti,- Uddyana - Nauli,- KapalaBhati.

Pranayama :Puraka - Kumbhaka - Rechala - suryahedhan - Ujjayi - Bhastrika - Nadishodhana -Sheetali - Shitkari.

TEXT BOOKS

- Iyenkar, B.K.S., 2005, "Light on Yoga", Thirty Second Edition, Harper Colling Publication, London.

REFERENCE BOOKS

1. Pramanik.T.N., 2013 "Yoga for Healthy Body", Sports Publications, New Delhi.
2. Qureshi.S.S., 2013"Yoga Cures Diabetes" Sports Publications, New Delhi.

(TRACK AND FIELD EVENTS – II AND GYMNASTICS)

(For those admitted in June 2019 and later)

Contact hours per week:3+5 Credits:4

Contact hours per semester:45+75 Subject Code : U19PEP43

COURSE OUTCOMES:

Students, after successful completion of the course, will be able to

CO1: Be familiar with the strategy and tactics in sports

CO2: Develop various skills in track and field events

CO3: Learn the various skills in gymnastics events

CO4: Acquire the knowledge of fundamental movements in track and field. gymnastic events

CO5: Obtain the knowledge of rules and regulations, and learn methods of gymnastics

LIST OF PRACTICALS TRACK AND FIELD EVENTS-II

i. Triple jump: Approach run, take off and landing for hop and jump, flying phase and landing.

ii. Discus throw: Hand hold, initial stance, preliminary swings, turn, delivery stance, delivery action and follow through.

iii. Hurdles - Approach run, take off or attack phase, clearance of the hurdle or inter-phase, lead leg action, trailing leg action, body position, landing or escape in between the hurdles and techniques at finish.

iv. Relays: Styles of baton exchange and fixing up runners for different relay races

GYMNASTICS

1. Elementary and basic elementary gymnastic movements: Pommel horse Pommel horse: Single leg circle outward (from uneven support), scissors forward, scissors forward (from uneven support), both leg circle, single leg circle and dismount from uneven support).
2. Roman rings: Hanging scale rear ways, upstart 'L' support on roman ring, shoulder stand and dislocation.
3. Rhythmic Gymnastics- Preliminary exercises of Rope, Hoop, Club, Ribbon and Wands.

TEXT BOOK

- De pak .J. 2000. "Coaching Track and Field", First Edition, Khel Sahitya Kendra, New Delhi.

REFERENCE BOOKS

1. Sandhu, V., 2006. "Teaching & Coaching Athletics". Sports Publication, New Delhi.
2. Narang. P. 2005, "Athletic Training". First Edition, Lakshay Publication, Chennai.
3. Loyd. R., 2011, "Gymnastics Skills - Techniques - Training", The Crouched Press Publication, New Delhi.
4. Jain, R. 2003, "Men Gymnastics Coach Manual", First Edition, Sports Publications, New Delhi.

Course Name: **Bachelor of Vocational**
Discipline: **Food Safety & Quality Management**
(FOR THOSE WHO JOIN IN 2019 AND AFTER)
Duration of the Course: **Three Years**

SCORE SCHEME

Semester	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
III	Soft Skill Development	6	4	25+75=100	B19FSC31		New
	Principles of Food Safety and Quality Management (PFSQM)	6	7	25+75=100	B19FSC32		New
	Training at any Food Industry for PFSQM	6	2	100 (Internal)	B19FSC33		New
	Food Chemistry -I	6	6	25+75=100	B19FSA31		New
	Food Chemistry -I Practical	4	5	40+60=100	B19FSP31		New
	Electives 1. **Food Processing in Pulses and Oil seeds** 2. Food Processing in Cereals 3. Food Processing in Fruits and Vegetables	2	4	25+75=100	**B19FSE31** / B19FSE32/ B19FSE33		New
	Industrial Trip Report (Minimum 2 trips)		2	50 (Internal)	B19FSIV3		New
IV	Marketing, business administration and International trade	6	4	25+75=100	B19FSC41		New
	Food Commodities and Food Preservation Technology (FCFP)	6	7	25+75=100	B19FSC42		New
	Training at any Food Industry for FCFP	6	2	100 (Internal)	B19FSC43		New
	Food Chemistry -II	6	6	25+75=100	B19FSA41		New
	Food Chemistry –II Practical	4	5	40+60=100	B19FSP41		New
	Electives 1**. Food Processing in Poultry and its Products** 2. Food Processing in Fish and its Products 3. Processing in Water Quality Analysis	2	4	25+75=100	**B19FSE41** / B19FSE42/ B19FSE43		New
	Minor Project at any industry		2	50 (Internal)	B19FS4PR		New
	Total	**30**	**60**	**650**			

SEMESTER – III
SOFT SKILL DEVELOPMENT - Part III

Contact hours per week: **6** **Subject code: B19FSC31**
Contact hours per semester: **60** (30Theory + 30Skill) **Credits: 4** (**2**Theory + **2** Skill)
Course outcomes:
Students, after successful completion of the course , will be able to

CO1 : Describe and analyze the principles of food processing design and production techniques.
CO2 : Demonstrate the capacity to research, assimilate and apply advances in food processing technology.
CO3 : Understand the principles of quality management systems.
CO4 : Use and apply quality management systems to food processing.

Section –A Theory

Unit 1 **(10 Hrs)**

Meaning of soft skills – Soft skills versus hard skills – The importance of soft skills in the competitive job market today – Selling your soft skills – Attributes regarded as soft skills – Identifying your soft skills – Enhancement of your soft skills through training.

Unit 2 **(10 Hrs)**

What is resuming? – The importance of a resume in an interview – Details to be included in a resume – Do's for resume preparation – Don't' for resume preparation – Resume preparation for freshers – Resume preparation for candidates with experience.

Unit 3 **(15 Hrs)**

Meaning of career goal – The importance of "Know Thyself" or self assessment – What is SWOT analysis – Long term goal and short term goal – Career opportunities today – Source of career information – Importance of career guidance.

Unit 4 **(15 Hrs)**

What is GD? – Necessity of GD in an interview – Characters tested in a GD – Skills required in a GD – Types of GD – Body language in a GD – Movements and gestures to be avoided in GD – Topics for GD – GD etiquette.

Unit 5 **(10 Hrs)**

Why an interview – Types of interview – Anticipated interview questions – Body language in an interview dress code in an interview – Do's in interview – Don'ts in an interview – Post interview etiquette – Salary negotiation in an interview.

Reference Books:

1. Barbara Kasser, "Using the internet" Fourth edition, EE Edition, New Delhi, 1998.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 2**

- Study of individual soft skills, its importance and develops through proper training.
- Learning the resume preparation methods and enhance the freshers to attend interview.
- Determination of career goal of individuals and learn present opportunities in the field.
- Developing the individuals for group discussion and know its importance to get a job.
- Study of the types of interviews and learn the parameters should be followed in it.

Core 5 - PRINCIPLES OF FOOD SAFETY AND QUALITY MANAGEMENT (PFSQM)

Contact hours per week: 6 **Subject code: B19FSC32**
Contact hours per semester: **75** (45 Theory + 30 Skill) **Credits:** 7 (4 Theory + 3 Skill)

Course outcomes:

Students, after successful completion of the course, will be able to

CO1 : Analyze and communicate issues relevant to food processing technology and food quality management systems.
CO2 : Perform experiments assessing the effect of processing conditions on quality parameters.
CO3 : Communicate the science and technology involved in food processing and quality assurance through IT implemented reports and presentations.
CO4: Review and report upon the latest scientific literature pertaining to the areas of Food Processing and Quality Assurance.

Section- A: Theory

Unit 1 **(15 Hours)**

Principles of quality control - Raw material process control and Product inspection. Food adulteration and hygiene - definition, Common adulterants in different foods and methods of detecting adulterated foods.

Unit 2 **(15 Hours)**

Food additives - Definitions, types, action - Leavening agents: definitions and classifications. sweetening agents, flavors, stabilizers, color – uses and optimum level Color of foods - Natural colors, certified artificial colors, non-certified colors, uses and optimum levels.

Unit 3 **(15 Hours)**

Enzymes of importance in food processing - Amylases, Proteases, lipases, oxidoreductases, hydrolases. Standards for foods - Milk and milk products, Fruits and Vegetables, Beverages and Fleshy foods

Unit 4 **(15 Hours)**

Consumerism - Definition, Consumer protection act, Consumer Education, Legal modes of protection act and Machinery for redressal of consumer grievances.

Unit 5 **(15 Hours)**

Evaluation of quality of foods: Sensory Evaluation of foods - Requirement for conducting sensory tests, Types of test, limitation of sensory evaluation.

Text Books:

1. Adams M.R. & Moss M.O. Food Microbiology, New Age International Private Ltd. Publications, London.
2. Frazier W.C. & Westhoff D.C. Food Microbiology, Fifth Edition, McGraw Hill Publications, New York.
3. Sri Lakhsmi Food Science 7th Edition

Reference Books:

1. Peppler H. J., 1979, Microbial Technology, Volumes I and II- Academic press, New York.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 3**

- Study of the impact of food adulteration and adulterated foods.
- Analysis of safety of food materials and food processing techniques.
- Study of the violations in the food additives and adulterations.
- Study of the food laws governing the food products.
- Learning the quality of foods and evaluation tests to maintain the quality of foods.

Core – 6 TRAINING (AT ANY FOOD INDUSTRY FOR (PFSQM)

Credits: 2 **Subject Code: B19FSC33**

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Narrate and compile the information and data that is used to construct and assess about the company safety and risk management programs.

CO2: Introduction review on instrumentation, labors and processing. And predict the company future developments.

List of Industrial Visits Areas:

Masala food products,
Milk and milk products,
Frozen food products,
Heat and control food products,
Animal nutrition food products,
Agro foods products,
Foods and Beverages products,
Seafood products,
Poultry and egg products,
Vegetables sauce manufacture,
Sugar and sugar recipe and Jam and pickles products

Allied 5 - FOOD CHEMISTRY-I

Contact hours per week: 5 **Subject code: B19FSA31**

Contact hours per semester: **75** (45 Theory + 30 Skill) **Credits:** 6 (4 Theory + 2 Skill)

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1 : Learn the food materials and its origin

CO2 : Know the various nature of food materials and its importance

CO3 : Analyze the various food materials based on its physical and chemical properties.

CO4 : Learn the processes of preservation and storage without contamination and learn waste management system

Section- A: Theory

Unit 1 **(15 Hours)**

Introduction to food chemistry - Physio chemical properties of foods – Colloids - Foams and emulsions – Role of water in food products – Bound water in food products

Unit 2 **(15 Hours)**

Chemical composition, nutritive value and basic nutrients: Carbohydrates proteins and lipids - Essential nutritive factors: Vitamins (Fat soluble and water soluble) and minerals (Ca, K, Fe, I and P)

Unit 3 **(15 Hours)**

Anti-nutritive Factors: Natural toxic Compounds, food contaminants: Physical, Chemical and Biological (exogenic and endogenic) - hygienic toxicological quality of food - other components influencing food quality.

Unit 4 **(15 Hours)**

Food analysis - Sampling techniques of food products - Physical and Chemical analysis of foods, Instrumentation in food analysis: pH meter, Colorimeter and Bomb calorimeter.

Unit 5 **(15 Hours)**

Food preservation – Irradiation High temperature and low temperature – Preservatives: Natural and artificial

Text Books:

1. Sree Lakshmi, Food Science, New Age International Publishers, Chennai.
2. Silley P. and Forsythe S. (1996). Impedance Microbiology - A rapid change for Microbiologists - A review. Journal of Applied Bacteriology, 80: 223- 243
3. Dziezak J. D. 1987. Rapid methods for analysis of foods. Food Technology 41(7): 56-73.
4. Johnson Green, Perry, 2002. Diagnostic systems. In Introduction to Food Biotechnology, CRC Press, Florida.
5. Vennila, Principles on Preservation of Fruits and Vegetables

Reference Books:

1. Jellifie, D.B.: Assessment of the nutritional status of the Community; World Health Organization.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 2**

1. Study of various origins and sources of foods.
2. Determination of food contents like water, sugars and proteins.
3. Determination of food contents like lipids, vitamins and food additives.
4. Study of food samples analyzing techniques for physical and chemical properties.
5. Study of food processing, packaging and preservation in industry.

Allied 6 - FOOD CHEMISTRY – 1 PRACTICAL

Contact Hours per week: 4 **Subject Code: B19FSP31**
Contact Hours per semester: 60 (60 Practical + 40 Skill) **Credits:** 5 (5 Skill)

Section –A

Course outcomes

Students, after successful completion of the course, will be able to
CO1: Learn moisture present in the food materials
CO2: Learn ingredient level of protein, fat, vitamins and pH values of the various food products
CO3: Estimate chemical components present in the food products
CO4: Learn the presence of pigments and micro chemicals

List of Experiments:

1. Calibration of Glassware
2. Moisture in Food Products by Hot-air oven-drying Method
3. Moisture in Food Products by Dean and Stark Method
4. Moisture in Food Products using Karl Fischer Titration Method
5. Determination of total, non-reducing and reducing sugars.
6. Determination of Protein in food sample by Lowry's method.
7. Protein Content in Food Products by Kjeldahl Method
8. Determination of Crude Fat in food sample by Soxhlet method.
9. Total fat in foods by Rose Gottleib Method
10. Starch in Cereal Grains by Acid Hydrolysis Method

Reference Books:

1. J. G. Cappucino and N. Sherman, 2014, Microbiology: A laboratory manual, 11/e, Pearson publications United States.

Self study paper: 1
FOOD PROCESSING IN PULSES AND OIL SEEDS

Contact Hours per week: Nil **Subject Code: B19FSE31**
Contact Hours per semester: Nil **Credits:** 4 (2 Theory + 2 Skill)

Course Outcomes:

Students, after successful completion of the course, will be able to
CO1. Understand the technology for Wheat Milling & Wheat based Food Products.
CO2. Acquire the knowledge of the technology for Rice Milling & Rice based other Food Products.
CO3. Know the technology for Oil Extraction & Oil Seed Processing along with equipments.

Unit 1

Introduction Wheat -Types, milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, Products and By-products. Rice – Physicochemical properties, milling (mechanical & solvent extraction), parboiling, ageing of rice, utilization of by products.

Unit 2

Corn – Milling (wet & dry), cornflakes, corn flour Barley- Milling (pearl barley, barley flakes & flour Oats – Milling (oatmeal, oat flour & oat flakes. Sorghum and millets – Traditional & commercial milling (dry &wet). Rye and triticale—milling (flour), uses.

Unit 3

Milling of pulses, Dry milling, Wet milling, improved milling method

Unit 4

Introduction, Extraction of oil and refining, Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fibre spinning

Unit 5

Alcoholic beverages: Beer, Wine, Distilled Spirits commercial usage.

Text Books:

1. Chakrabarty MM. 2003. Chemistry and Technology of Oils and Fats. Prentice Hall.
2. Dendy DAV & Dobraszczyk BJ. 2001. Cereal and Cereal Products. Aspen.
3. RJ & Bhati A. 1980. Fats and Oils - Chemistry and Technology. App. Sci. Publ.
4. Hoseney RS. 1994. Principles of Cereal Science and Technology. 2nd Ed. AACC.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 2**

1. To develop proficiency skill in producing different processed pulses and oilseeds food products, operating& maintenance the modern equipment's& machineries
2. Make different processed food products with quality assurance, and Process of Packaging, Storing & marketing.
3. To acquaint with production and consumption trends, structure, composition, quality evaluation, and processing technologies for product development and value addition of various cereals, pulses and oilseeds.
4. Study of food processing, packaging and preservation in industry.

Self study paper: 2

FOOD PROCESSING IN CEREALS

Contact Hours per week: Nil **Subject Code: B19FSE32**
Contact Hours per semester: Nil **Credits:** 4 (2 Theory + 2 Skill)

Course outcomess:

Students, after successful completion of the course, will be able to
CO1. Understand the working of equipments related to Wheat & Rice Milling along with equipments related to Wheat based & Rice based Food Products.
CO2. Understand technology for Milling of Corn & Corn based other Food Products along with equipments and know how to operate it.

Unit 1

Present status and future prospects of cereals and millets, Morphology, physico-chemical properties of cereals, major and minor millets Chemical composition and nutritive value.

Unit 2

Paddy processing and rice milling: Conventional milling, modern milling Milling operations, milling machines, milling efficiency; Quality characteristics influencing final milled products. Parboiling, Rice bran stabilization and its methods, aging of rice; Enrichment of rice – Methods of enrichment; Rice fortification.

Unit 3

Corn milling: Dry and wet milling of corn, starch and gluten separation, milling fractions and modified starches. Barley: Malting and milling Oat/Rye: Processing, milling Sorghum: Milling, malting, pearling Millets (Pearl millets, finger millets)

Unit 4

Secondary and tertiary product processing of cereals and millets, By-products of cereals and millets processing - Processing of millets for food uses.

Unit 5

Processing of infant foods from cereals and millets. Breakfast cereal foods: Flaked, puffed, expanded, extruded and shredded.

Text Books:

1. Chakraverty, A. and Singh, R. P. 2014. Post Harvest Technology and Food Process Engineering. CRC Press, Boca Raton, FL, USA.
2. Khan, K. and Shewry, P. R. 2009. Wheat: Chemistry and Technology, 4th Ed., AACC International, Inc., St. Paul, MN, USA. Wrigley, C. 2004.
3. Encyclopedia of Grain Science. Academic Press, London, UK. Champagne, E. T. 2004. Rice: Chemistry and Technology, 3rd Ed., AACC International, Inc., St. Paul, MN, USA.
4. Chakraverty, A., Mujumdar, A.S., Vijaya Raghavan G.S. and Ramaswamy, H. S. 2003.
5. Handbook of Post Harvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices. Marcel Dekker, Inc., NY, USA.
6. White, P. J. and Johnson. L. Lawrence A. 2003. Corn: Chemistry and Technology, 2 nd Ed., AACC International, Inc., St. Paul, MN, USA. David A.V. Dendy and Bogdan J. Dobraszczyk. 2001.

Reference Books:

1. Cereal and Cereal Products: Technology and Chemistry. Springer-Verlag, US. Kent, N.L. and Evers, A.D. 1994.
2. Kent's Technology of Cereals: An Introduction for Students of Food Science and Agriculture, 4th Ed. Elsevier Science Ltd., Oxford, UK. Matz, Samuel A. 1991.
3. The Chemistry and Technology of Cereals as Food and Feed, 2nd Ed. Springer Science + Business Media, NY, USA. Araullo, E.V., D.B. De Padna and Graham. 1976.
4. Rice Post Harvest Technology. IDRC, Canada.

Self study paper: 3
FOOD PROCESSING IN FRUITS AND VEGETABLES

Contact Hours per week: Nil
Contact Hours per semester: Nil
Subject Code: B19FSE33
Credits: 4 (2 Theory + 2 Skill)

Course outcomes:
Students, after successful completion of the course, will be able to

CO 1: Understand Biological, Chemical & Physical Properties of Fruits & Vegetables.
CO2: Understand Technologies involved in Processing, Preservation & Value- Addition of Fruits & Vegetables.
CO3: Gain knowledge on Industrial Processes for Commercial Production of Jams, Jellies, Marmalade, Fruit Juices, Juice Powder, Dehydrated Fruits, and Canning of Fruits & Vegetables.
CO4: Understand Basics of New Food Products Development & Ideas Generation for Product Development.

Unit 1

Production and processing scenario of fruits and vegetables in India and world; Scope of fruit and vegetable processing industry in India.

Unit 2

Overview of principles and preservation methods of fruits and vegetables; Supply chain of fresh fruits and vegetables Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables.

Unit 3

Minimal processing of fruits and vegetables; Blanching- operations and equipment. Canning:- Definition, processing steps and equipment; Cans and containers, quality assurance and defects in canned products.

Unit 4

Preparation and preservation of juices, squashes, syrups, sherbets, nectars and cordials. FSSAI specifications of crystallized fruits and preserves, jam, jelly and marmalades, candies. Preparation, preservation and machines for manufacture of above products.

Unit 5

Preparation, preservation and machines for manufacture of chutney, pickles, sauce, puree, paste, ketchup, papads and soup powders. Production of pectin and vinegar.

Text Books:

1. U.D. Chavan and J.V. Patil. 2013. Industrial Processing of Fruits and Vegetables. Astral International Pvt. Ltd., New Delhi. S. Rajarathnam and R.S. Ramteke. 2011.
2. Advances in Preservation and Processing Technologies of Fruits and Vegetables. New India Publishing Agency, New Delhi. Y.H. Hui. 2006.

3. Handbook of Fruits and Fruit Processing. Blackwell Publishing Ltd., Oxford, UK. W.V. Cruess. 2004. Commercial Fruit and Vegetable Products. Agrobios India, Jodhpur. 49 Y. H. Hui, Sue Chazala, Dee M. Graham, K.D. Murrell and Wai-Kit Nip. 2004.
4. Handbook of Vegetable Preservation and Processing. Marcel Dekker, Inc., NY, USA. A.K. Thompson. 2003. Fruit and Vegetables: Harvest, Handling and Storage, 2nd Ed. Blackwell Publishing Ltd., Oxford, UK.

Reference Books:

1. R.P. Srivastava and Sanjeev Kumar. 2002. Fruit & Vegetable Preservation: Principles and Practices, 3 rd Ed. International Book Distribution Co., Delhi. P.H. Pandey. 1997.
2. Post Harvest Technology of Fruits and Vegetables. Saroj Prakashan, Allahabad. Mircea Enachescu Dauthy. 1995.
3. Fruit and Vegetable Processing. FAO Agricultural Services Bulletin No.119. FAO of UN, Rome. Girdhari Lal, G.S. Siddappa and G.L. Tandon. 1959.
4. Preservation of Fruits and Vegetables. ICAR, New Delhi. EIRI Board of Consultants and Engineers. Manufacture of Snacks, Namkeen, Papads and Potato Products. EIRI, New Delhi.

INDUSTRIAL VISITS

Contact Hours per week: Nil
Contact Hours per semester: Nil

Subject Code: B19FSIV3
Credits: 2 (2 Skill)

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1: Industrial visits offer a great source to gain practical knowledge.

CO2: Students can observe and learn as to how theatrical concepts are put to into action, thereby aiding their practical learning.

CO3: Students are exposed to real working environment and shown how things are done in an organization.

Keeping this objective at hand, the department organizes excursion tours cum industrial visits which are within the framework of the curriculum. The excursions and industrial visits are for the academic year students which are relevant to the stream of study of the programme.

Semester – IV

BUSINESS ADMINISTRATION AND INTERNATIONAL TRADE CONTACT

Contact hours per week: 6
Contact hours per semester: **60**

Subject code: B19FSC41
Credits: 4 (2 Theory + 2 Skill)

Section –A Theory

Course outcomes:

Students, after successful completion of the course, will be able to

CO1 : Contribute to economic development by maintaining consumer confidence in the food system and providing a regulatory foundation for international trade in food
CO2: Create and modify food safety and quality assurance system components such as policies, procedures, and instructions, based on scientific principles.
CO3: Recommend means to mitigate and control risks through cleaning and sanitation, traceability, HACCP, Good Manufacturing and Good Agricultural Practices

Unit 1 **(15 Hours)**

Introduction to Financial Accounting: Recording of transactions, Preparation of Final Accounts; Fundamentals of Financial Management: Steps in Capital Budgeting, Working Capital Management; Factors affecting Working Capital, NPV.

Unit 2 **(10 Hours)**

Overview of marketing management; market structure and consumer buying behavior; marketing opportunities analysis.

Unit 3 **(10 Hours)**

Market measurement; product policy and planning; pricing decisions; promotion-mix decisions.

Unit 4 **(15 Hours)**

Basis, trends and composition of India's Foreign trade. Institutes for promotion of Indian agricultural / horticultural trade and export inspection agencies. Export documentation, Procedures.

Unit 5 **(10 Hours)**

Trade Act regulations relating to maintaining hygienic conditions, Consumer Protection Act 1986; international marketing and international trade; exports. Role of Institute like Export/Import Bank and ECGC (Export Credit Guarantee Corporation)

Text Books:

1. Adams M. R. & Moss M. O. Food Microbiology, New Age International Private Ltd. publications, London.
2. Frazier W. C. & Westhoff D. C. Food Microbiology Fifth Edition, McGraw Hill publications, New York.

Reference Books:

1. Export / import policy by Govt. of India. Export / import data by DGCIS - Calcutta. Export documentation by Nashi Publication.
2. Darrah L.B.1971. Food Marketing. The Ronald Press Comp. New York.
3. Kacker M. 1982. Marketing and Economic Development, Deep and Deep Pub., New Delhi.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 2**

- Understanding the financial accounting and fundamentals of financial management.
- Study of marketing management and analysis of marketing opportunities.
- Learning the market measurement and product policy, planning and pricings.
- Study of composition of foreign trade and export credit guarantee corporation.
- Study of trade act regulations, consumer act and international marketing.

Core 7 - FOOD COMMODITIES AND FOOD PRESERVATION TECHNOLOGY (FCFP)

Contact hours per week: 6 **Subject code: B19FSC42**
Contact hours per semester: **60** **Credits: 7** (4 Theory + 3 Skill)

Course outcomes:

Students, after successful completion of the course will be able to

CO1: Identify the important pathogens and spoilage microorganisms in foods and the conditions under which they will grow.
CO2: Identify the conditions under which the important pathogens are commonly inactivated, killed or made harmless in foods.
CO3: Know the principles involving food preservation via fermentation processes.

Section –A Theory

Unit 1 **(15 Hours)**

Cereals (Rice and Wheat), Millets (Ragi and Bajra) and Pulses (Moong Dhal and Black gram dhal) - Storage, Nutritional aspects and cost.

Unit 2 **(15 Hours)**

Milk and Milk products - Selection Quality and Cost, Processing, Storage, Nutritional aspects, shelf life and spoilage.

Unit 3 **(10 Hours)**

Eggs, Meat, Fish and Poultry - Quality selection, storage, cost, nutritional aspects - Vegetables and Fruits - storage, nutritional aspects of raw and processed products

Unit 4 **(10 Hours)**

Sugar and sugar Products - Types of natural sweeteners, storage and use as preserves, Fats and oils - Processing, storage, cost and nutritional aspects. Salt - types & uses

Unit 5 **(10 Hours)**

Objectives and techniques of food preservation, canning, lacquering, thermal process time and spoilage in canned foods - Preservation by fermentation - curing, pickling and hurdle technology.

Reference Books:

1. Food Science by Potter, Fruits and vegetable processing by Cruss.
2. Preservation of Fruits & Vegetables by IRRI.
3. Lavies, S (1998): Food Commodities Ltd. London.
4. Hughes 0. and Bennion M. (1970); Introductory Foods, Macrnillan & Co., New York.
5. Pyke M. (1974); Catering Service and Technology, John Murrey Publication, London.
6. B. Shrilakshmi: Food Science Manne Sakuntala : Food Science.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 3**

- Study of nature of milk, cereals, millets and its processing, storage and spoilage.
- Learning the nature of egg, meat, fish and its processing, storage and spoilage.
- Study of nature of sugar, fat, salt and its processing, storage and spoilage.
- Learning the physical and chemical methods of preservations.
- Study of various types of food preservations and fermentation technology.

Core – 6 TRAINING (AT ANY FOOD INDUSTRY FOR FCFP)

Credits: 2 **Subject Code: B19FSC43**

Course outcomes:
On successful completion of this module the student will:

CO1 It helps to narrate and compile the information and data that is used to construct and assess about the company safety and risk management programs.

CO2 Format: Introduction review on instrumentation, labors and processing. And predict the company future developments.

Cocoa food products, Coffee manufacture company, Orange juice Frozen & Preservation Company, Grains, wheat, soybeans, soybean oil, rice, oats, and corn production and Preservation Company. Sugar and sugar recipes, jam, jellies and pickles products and Preservation Company.

Allied 7 - FOOD CHEMISTRY-II

Contact hours per week: 6 **Subject code: B19FSA41**
Contact hours per semester: 75 **Credits: 7** (4 Theory + 2 Skill)

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Know the spoilage and deterioration mechanisms in foods and methods to control deterioration and spoilage.

CO2: Enlist the principles that make a food product safe for consumption.

CO3: Get knowledge about the transport processes and unit operations in food processing as demonstrated both conceptually and in practical laboratory settings

CO4: Operate the mass and energy balances for a given food process and describe the unit operations required to produce a given food product.

Section –A Theory

Unit 1 **(12 Hours)**

Food and its functions constitution of chemicals in food – Basic five Food groups – Functional foods and nutraceuticals – Definition and health benefits.

Unit 2 **(16 Hours)**

Introduction to nutrition: Definition, nutritional status, good nutritional status, poor nutritional status, malnutrition, and Biological functions of nutrients.

Unit 3 **(16 Hours)**

Food and our body: digestion and absorption of food Buccal digestion, gastric digestion and intestinal digestion - factors affecting digestion and absorption

Unit 4 **(16 Hours)**

Energy metabolism: Introduction, unit of measurement, energy value of food – Bomb calorimetry; Total energy requirements of the body - Reference man and reference woman; basal metabolic rate, factors affecting the BMR

Unit 5 **(15 Hours)**

Nutritional assessments of humans: Clinical findings, nutritional anthropometry, biochemical tests and biophysical method.

Text books:

1. Adams M. R. & Moss M. O. Food Microbiology, New Age International Private Ltd. publications, London
2. Frazier W. C. & Westhoff D.C. Food Microbiology Fifth Edition, McGraw Hill publications, New York.

Reference Books:

1. Jellifie D. B. Assessment of the nutritional status of the Community; World Health Organization.
2. Sain D. R., Lockwood R., Scrimshaw N. S: Methods the Evaluation of the Impact of Food and Nutrition programmes, United Nations University. Aurand L.W. and Woods A.E. 1973. Food Chemistry. AVI, Westport.
3. Birch G.G., Cameron A.G. and Spencer M. 1986. Food Science, 3rd Ed. Pergamon Press, New York.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 2**

- Study of chemical constituents, scope and importance of chemicals in food.
- Learning the nutritional statuses like malnutrition, poor nutrition and good nutrition.
- Study of various metabolic functions in body and influences of various factors.
- Measurement of various levels of energy value in body and factors affecting BMR.
- Study of nutritional assessment of humans and clinical studies.

Allied 8 – FOOD CHEMISTRY – II PRACTICAL

Contact hours per week: 4 **Subject code: B19FSP41**
Contact hours per semester: 60 (60+ 40) **Credits: 5**

Section – A

Course outcomes:

Students, after successful completion of the course, will be able to

CO1: Explain the principles and current practices of processing techniques and the effects of processing parameters on product quality.
CO2: Apply principles from general chemistry, biology, physics, statistics, and mathematics to food science problems
CO3: Generate nutritional panels for food products using the vital program. Hygiene and sanitation, including good manufacturing practice

List of Experiments:

1. Determination of pH in food sample.
2. Estimation of Vitamin C in food sample.
3. Determination of Pigments in food sample.
4. Estimation of Ash content in food products.
5. Estimation of calcium in food products.
6. Estimation of iron in food products.
7. Estimation of zinc in food products.

8. Estimation of Iodine in food products.
9. Determination of food adulterants in food products – Honey, Turmeric and Pepper.
10. Determination of tin in food products.

Reference Books:

1. Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel
2. Dekker, New York.
3. Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.
4. Potter, N.N. 1978. Food Science. 3rd Ed. AVI, Westport

Self study paper: 1

FOOD PROCESSING IN POULTRY AND ITS PRODUCTS

Contact Hours per week: Nil **Subject Code: B19FSE41**
Contact Hours per semester: Nil **Credits: 2**

Course outcomes:

Students, after successful completion of the course, will be able to
CO1: Know the significance and necessity of organized animal products sector, humane slaughtering of poultry and value addition of poultry egg.
CO2: Understand need and importance of livestock, egg and poultry industry
CO3: Learn the structure, composition and nutritional quality of animal products.
CO4: Learn the processing and preservation of poultry foods.
CO5: Understand technology behind preparation of various poultry food products and byproduct utilization.
CO6:. Gain knowledge on status & scope of Poultry industry worldwide.

Unit 1

Introduction to Livestock and poultry population in India, Development of poultry industry in India and its need in nation's economy, Glossary of live market terms for birds.

Unit 2

Sources and importance of poultry. Structure, classification and composition of muscle and types - Pre-slaughter operations and slaughtering operations for poultry.

Unit 3

Preservation of poultry by chilling, freezing, pickling, curing, cooking and smoking, canning, dehydration, radiation, chemical and biological preservatives. Novel methods: Low dose irradiation; High pressure treatment, hurdle barrier - concept for- poultry.

Unit 4

Quality of eggs - internal and external quality evaluation, candling, albumen index, haugh unit, shape index and yolk index. Grading of eggs. Pasteurization, dehydration, freezing and desugarization of egg.

Unit 5

Liquid egg products, egg powder, value added egg products (meringues and poached egg). Packaging of egg and egg products.

Text Books:

1. Vikas Nanda. 2014. Meat, Egg and Poultry Science & Technology. I.K. International Publishing House Pvt. Ltd., New Delhi.
2. Meat Processing-Improving Quality. Woodhead Publishing Ltd., Cambridge, England. B.D. Sharma. 1999.
3. Meat and Meat Products Technology Including Poultry Products Technology. Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi.

Reference Books:

1. Egg Science and Technology, 4th Ed. Food Products Press, NY, USA. R.A. Lawrie. 1985.
2. Brigitte Maas-van Berkel, Brigiet van den Boogaard and Corlien Heijnen. 2004. Preservation of Fish and Meat. Agromisa Foundation, Wageningen. FAO. 2003.
3. Code of Practices of Canned Fishery products. FAO, UN, Rome.
4. Brend W. Rautenstrauss and Thomas Liehr. 2002. Fish Technology. Springer-Verlag, US. G.M. Hall. 1997.
5. Fish Processing Technology, 2nd Ed. Chapman & Hall, London, UK.

Self study paper: 2
FOOD PROCESSING IN FISH AND ITS PRODUCTS

Contact Hours per week: Nil
Contact Hours per semester: Nil

Subject Code: B19FSE42
Credits: 2

Course outcomes:

Students, after successful completion of the course, will be able to
CO 1. Know about the significance & necessity of organized animal product sector.
CO 2. Acquire the ability of value- addition Fish.
CO 3. Understand the processing, preservation & quality control of Fish in Food Industry.
CO 4. Gain knowledge of manufacturing practices of fish based by products & their processing techniques.

Unit 1

Introduction Status of fishery industry in India. Chilling and Freezing of fish Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems (air blast freezing), changes in quality of chilled and frozen storage and thawing.

Unit 2

Fish Curing and Smoking Drying and salting of fish, water activity and shelf-life , salting process, salting methods (brining, pickling, kench curing, gaspe curing), types of salts, dried and salted fish products- pindang, fishwood, dried shrimp.

Unit 3

Canning of fish - Principles of canning, classification based on pH groupings, effect of heat processing on fish, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products.

Unit 4

Quality of fresh fish. Processing of fish. Manufacturing of fish paste, fish sauces, fish oil, fish protein concentrate.

Unit-5

Fermented fish and flowchart of Indigenous products - Concept of other Sea foods Crabs, lobsters, prawns, shrimps and shell- fish.

Text Books:

1. Hui, Y. H. (2010). Handbook of Poultry Science and Technology.
2. . Fernandes, R. (2009). Fish and Seafood.
3. Varnam, A. H. & Sutherland, J. P. (1995). Meat and Meat Products: Technology, Chemistry and Microbiology: Champan & Hill, London.

Reference Books:

1. Lawrie, R. A. (1998). Lawrie's Meat Science (6th ed.): Woodhead, Cambridge.
2. Kerry, J., Kerry, J. & Ledward, D. (2002). Meat Processing Improving Quality: CRC Press, USA.

Section –B Skill Component

Contact hours per semester: **30** **Credits: 2**

1. Maintains various records in processing plants like Hazard analysis work sheet, HACCP plan form, Tunnel freezer register, Plate freezer registers, Consolidated daily production register, Daily sanitation check list, Check list for personal hygiene, Chlorination register, Register for analytical report, Raw material evaluation register, Register for pre-processing summary and Register for processing.
2. To provide an understanding of the technology for handling, processing, preservation and bi-product utilization of fish and fish products processing
3. Evaluates various inspection systems and Works with HACCP in Sea food industry.

Self study paper: 3
PROCESSING IN WATER QUALITY ANALYSIS

Contact Hours per week: Nil **Subject Code: B19FSE43**
Contact Hours per semester: Nil **Credits: 2**

Course outcomes:

Students, after successful completion of the course, will be able to
CO1: Understand the principles and operation of water treatment systems
CO2: Know the suitability of the design of treatment plants and unit processes
CO3: Evaluate process operations and performance
CO4:Understand coagulation, flocculation, and sedimentation, filtration, and disinfection processes.

Unit 1

Quantity of Water: Per-capita demand, design period, population forecast, fluctuation in demand General requirement: Sources of water, necessity of treatment, water quality standards for various water uses.

Unit 2

Principles of sedimentation: Types of settling and settling equations, design criteria and design of settling tanks. Principle of Coagulation and Flocculation – types of coagulants, coagulant aids.

Unit 3

Disinfection: different types of disinfectants, factors affecting disinfection, methods of disinfection and chemistry of chlorination, Ions causing hardness, Langelier index, Winkler's method.

Unit 4

Adsorption Process: Types, factors affecting adsorption, kinetics and equilibrium – different isotherm equations and their applications.

Unit 5

Water Softening:: Ion exchange, electro-dialysis, Reverse Osmosis, Ultra filtration Distribution system design and analysis, distribution reservoirs and service reservoirs.

Text Books:

1. Peavy, H.S., Rowe and Tchobonoglous,G., (1985), "Environmental Engineering", McGraw Hill
2. Raju, B.S.N., (1995), "Water Supply and Wastewater Engineering", Tata McGraw Hill Pvt. Co. Ltd., New Delhi.
3. Fair, G.M., Geyer J.C and Okun, (1969) "Water and Wastewater Engineering" Vol II, John Wiley Publications.

Reference Books:

1. Weber W.J., (1975) "Physico - Chemical Processes for Water Quality Control".
2. AWWA, (1971), "Water Quality and Treatment "McGraw Hill.
3. CPHEEO Manual, (1991), "Water Supply and Treatment", GOI Publications

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PROJECT WORK

Contact Hours per week: 2 **Credit : 2**
Contact Hours per Semester: NIL **Subject Code: B19FS4PR**

Course Outcomes:

Students, after successful completion of the course, will be able to

CO1: Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
CO2: Acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
CO3: Acquire collaborative skills through working in a team to achieve common goals.

CO4: Learn on their own, reflect on their learning and take appropriate actions to improve it.
CO5: Learn to work in groups, they will also learn independently through self-reflection and evaluation of their own work processes.

The aim of project work (lab work) is to inculcate students to learn adequate knowledge on research methodology in the subject and prepare them for pursuing research in experimental or computational areas of the subject. Student's allotment is done by lot system. The project work study is to be undertaken under the guidance of a Teacher of the Department. The guiding teacher will make continuous internal assessment of the Project Work. No teacher shall be permitted to guide more than eight students in a semester for Project Work under his/her supervision. The project work will be evaluated by the external examiner.

- Project will be done by the second year students in the fourth semester under the guidance of respective guides.
- For projects internal marks (Max 50) will be awarded by the respective guide and external examinations.
- Minimum number of pages for B.Voc. Project thesis shall be 30.

Course Name: **Bachelor of Vocational**
Discipline: **Renewable Energy**
(FOR THOSE WHO JOIN IN 2020 AND AFTER)
Duration of the Course: Three Years
COURSE SCHME:

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
I		Communicative English - 1	6	4	25+75=100	EV15E1		
		Mathematics-I	6	6	25+75=100	B20RET11		
		Value Education	2	2	25+75=100	U1VE11		
	Core 1	Fundamental of Energy and Energy Conservation	6	6	25+75=100	B20RET12	Skill Development	New
	SBE	Applied Physics – I	6	6	25+75=100	B20RET13	Skill Development	New
	Core 2 Lab	LAB: Energy and General Physics Lab-I	4	4	40+60=100	B20REP11	Skill Development	New
		Industrial Visit & Report	0	2	100 (Internal)	B20REIV1	Skill Development	New

Semester	Part	Subject	Hour	Credit	Int+Ext= Total	Subject Code	Focus on Employability/ Entrepreneurship/ Skill Development	Revised/ New/ No Change/ Interchanged If Revised % of Change
II		Communicative English -II	6	4	25+75=100	EV15E2		
		Mathematics - II	6	6	25+75=100	B20RET21		
		Environmental Studies	2	2	25+75=100	U1ES21		
	Core 3	Basic of Solar Energy	6	6	25+75=100	B20RET22	Skill Development	New
	SBE	Applied Physics – II	6	6	25+75=100	B20RET23	Skill Development	New
	Core 4 Lab	LAB: Energy and General Physics Lab-II	4	4	40+60=100	B20REP21	Skill Development	New
		Industrial Visit & Report	0	2	100 (Internal)	B20REIV2	Skill Development	New

SEMESTER - I
Communicative English - Paper I

Contact Hours per week: **6** **Credits:** 4 (**2**Theory + **2** Skill)
Contact Hours per semester: **60** (30Theory + 30Skill) **Subject Code: EV15E1**

Section –A Theory

Course Outcomes:
Students, after successful completion of the course, will be able to
1. Understand the concepts underlying various communication skills.
2. Know about several aspects of communication in oral and written modes.
3. Acquire the knowledge of necessary language skills.

Unit I – Grammar **6 hours**
i. Parts of Speech
ii. Tenses – Present, Past, Future

Unit II – Reading Skill **6 hours**
i. Comprehension of a Passage / Story / News

Unit III – Writing Skill **6 hours**
i. Narration of story
ii. Translation of sentences, short passages
iii. Letter writing (Informal Letters)

Unit IV – Phonetics **6 hours**
i. Vowels, Consonants, Diphthongs
ii. Transcription of words

Unit V – Speaking Skill **6 hours**
i. Introducing oneself and others, narration about an industry visited.
ii. Situational Communication – Greeting, Complimenting, Requesting etc.

Note: 2, 4 units are considered as a Language laboratory

Text Book
- *Advanced Skills for Communication in English*: Book I: V.Jeya Santhi

Reference Books:
Ren and Martin- High school English grammar and composition, BBC CD, TOEFL CD

1. G.Radhakrishna Pillai - *Emerald English Grammar & Composition*, Emera Publishers
2. Board of Editors - *Synergy – Communication in English and Study Skil* Orient Blackswan
3. Dr.S.Vincent - *Let's Speak English (A Course in Spoken Englis* Soundra Publications
4. K.R.Lakshminarayanan, T.Murugavel - *Communication Skills in English*, SciTech Publicatio Chennai.
5. G.Radhakrishna Pillai, K.Rajeevan - *Spoken English for You: Level One* Emerald Publisher

6.	Bikram K.Das	- *Functional Grammar and Spoken and Writt Communication in English*, Orient Longman Pvt., Ltd.
7.	A.R.Thorat, B.S.Valke, S.B.Gokhale	- *Enriching Your Competence in English* Orient Longm Pvt. Ltd.

Section –B Skill component

Contact Hours per semester: **30** **Credits: 2**

1. To impart and enhance communicative competency for professional mobility
2. To equip the student with necessary skills for employment
3. To prepare students for career in media
4. To develop ability of all students to read, write, listen, speak and think critically
5. To produce students with advanced skills in writing, reading and reasoning.

MATHEMATICS – I

Contact Hours per week:6 **Subject Code: B20RET11**

Contact Hours per semester: 90 (60 theory + 30 Skill) **Credits: 6** (**4**Theory + **2** Skill)

Course Outcomes:

Students, after successful completion of the course, will be able to

- Learn basic mathematics, data interpretations.
- Learn about effective presentation of data.

UNIT I **(12 Hours)**

Methods of collection of data - primary-secondary – sampling: classification and tabulation: tabulation of data – rules for tabulation - diagrammatic and graphic representation.

UNIT II **(12 Hours)**

Arithmetic mean – median – mode Range – quartile deviation – mean deviation – standard deviation – co-efficient of variation (combined standard deviation excluded)

UNIT III **(12 Hours)**

Correlation - Regression analysis – regression equations.

UNIT IV **(12 Hours)**

Forecasting Introduction - Finding missing data using Lagrange Interpolation Formulae and Lagrange's Inverse interpolation formula

UNIT V **(12 Hours)**

Computations using worksheet formula, Interpreting data using spread sheet – A Simple presentation of your data.

[All units are from text books only. Include the theory parts without proof and derivations. Problems only]

Text Books

1.R.S.N. Pillai and V. Bagavathi – Statistics

2.S.Arumugam, A.Thangapandi Isaac, A.Somasundaram, Numerical Method, Second Edition, SCITECH Publications.

Reference Books:

1. S. Narayanan and T.K. Manicavachagom, Differential Equations And Its Applications, S. Viswanathan(Printers & Publishers), Pvt. Ltd.
2. S.P. Gupta, Business statistics
3. Sancheti kapoor, Statistic: Theory, Methods and Application
4. J. H. Mathews, Numerical Methods for Maths, Science and Engineering, PHI, New Delhi, 2001.

VALUE EDUCATION

Contact Hours per week:2 **Subject Code: U1VE11**
Contact Hours per semester: 30 **Credits: 2**

Course Outcomes:
Students, after successful completion of the course, will be able to

- Understand the concepts of human values.
- Acquire the responsibilities with regard to making positive personal and social choices.
- Choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening them.

Unit I- Value Education **6 Hours**
Definition – Relevance to present day concept of Human values – Value and the Individual.

Unit II- Family and Family Values **6 Hours**
Responsibility of the Family – Neutralization of Anger Adjustability – Threats of family life – Status of Women in Family and Society – Caring for needy and elderly - Time allotment for sharing ideas and concerns.

Unit III- Ethics **6 Hours**
Ethical Values – Professional ethics – Mass media ethics – Advertisement ethics – Influence of Ethics on family life –Psychology of children and youth – Leadership qualities – Personality Development.

Unit IV- Social Values **6 Hours**
Faith, Service and Secularism – Social Sense and commitment - Students and politics – Social awareness – Consumer Awareness - Consumer rights and Responsibility.

Unit V- Global issues **6 Hours**
Effect of International Affairs on Values of life – Issues of Globalization – Modern warfare and terrorism – Environmental issues – Mutual respect for different culture, religion and their Values.

Suggested Books for Study
Lakshminarayanan, K.R. and Uma Maheswari, M., Value Education, Chennai.
Nellaiappar Publication.

FUNDAMENTAL OF ENERGY AND ENERGY CONSERVATION

Contact Hours per week: 6 **Subject Code: B20RET12**
Contact Hours per semester: **90** (30Theory + 60Skill) **Credits:** 6 (**2**Theory + 4 Skill)

Section- A: Theory

Course Outcomes:

Students, after successful completion of the course, will be able to

- Understand the Fundamental of Energy
- Know the Environmental aspects of Energy
- Learn about the Energy Status of World and India
- Know the basic of Energy Conversion.

Unit I Fundamental of Energy **(6 hours)**

Introduction - Energy Consumption and standard of living – oil crissis – classification of energy resources – consumption ternds of primary energy sources - Important of Non Conventional Energy Resources – Energy Chain - Common Forms of Energy - Advandages and Disadvandages of conventional energy sources - Salient Features of Non Conventional Energy Sources.

Unit II Environmental Aspects of Energy **(6 hours)**

Trade-off between Energy and Environment – Ecology – Green House Effect – Consequences of Global Warming – Pollution – Various Pollutants and their Harmful Effects – Green Power – Environment- Economy – Energy and sustainable Development.

Unit III World Energy Status **(6 hours)**

Present Situation - Availability of Resources and Future Trends - Conventional – Non Conventional.

Unit IV Energy Scenario in India **(6 hours)**

Overall production and consumption – Availability of Primary Energy Resources – Conventional – Non Conventional – Growth of Energy Sector and its Planning in India.

Unit V Energy Conversation **(6 hours)**

Introduction – Salient Features of Energy Conversation Act, 2001" - Various Aspects of Energy Conversation: Economic Aspects –Principle of Energy Conversion – General Electrical Eco's (energy Conversion Opportunities) – Cogeneration.

Text Book

B.H. Khan. ***Non Conventional Energy Sources.*** New Delhi: Tata Mcgraw Hill (P) Ltd. 2006.

Unit I Chapter 1 – 1.1 – 1.9
Unit II Chapter 1 – 1.10 – 1.11
Unit III Chapter 1 – 1.13
Unit IV Chapter 1 – 1.14
Unit V Chapter 2 – 2.1 – 2.5

Reference Books

1. G.D.Rai. ***Non Conventional Energy Sources.*** New Delhi: Kanna Publishers. Fifth Edition, Reprint 2012.

Section –B Skill component

Contact Hours per semester: **60** **Credits: 4**

1. Study of important and salient features of Non Renewable Energy
2. Study of Energy, Environment, Economy relation
3. Preparation of report of the world and India Energy Status
4. Demonstration of various aspects of Energy Conversation
5. Study of principles of energy conservation
6. Study of energy conservation opportunities.

APPLIED PHYSICS – I

Contact Hours per week: 6 **Credits:** 6 (2 Theory + 4 Skill)
Contact Hours per semester: **90** (30 Theory + 60 Skill) **Subject Code: B20RET13**

Section- A: Theory

Course Outcomes:

Students, after successful completion of the course, will be able to

- Learn about essential Units and Dimensions
- Learn about Work, Energy and power
- Get the Knowledge of Elasticity and Flow of Fluids
- Know the fundamental of Viscosity

Unit I Units and Dimensions **(6 hours)**

Units – Characteristics of a Standard of a Unit – System Units – Definition of Fundamental Units in SI – Supplementary Units – Prefixes used with Units – Dimensions – Units and Dimension of Some Physical Quantities – Uses of Dimensional Equations – Limitation of Dimensional Analysis.

Unit II Work, Energy and Power **(6 hours)**

Work – Energy – Forms of Energy – Potential Energy – Kinetic Energy – The Law of Conservation Energy – Power.

Unit III Elasticity **(6 hours)**

Introduction – Stress – Strain –Elastic limit – Hooke's Law – Young's Modulus (Y) – Bulk Modulus – Rigidity Modulus – Experimental Determination of Young's Modulus of a Wire (Searl's Method).

Unit IV Flow of Fluids **(6 hours)**

An Ideal Fluid – Streamline flow – Turbulent Flow – Energies of a Fluid in Flow – Continuity Equation – Bernoulli's Theorem – Aerofoil – Atomizer.

Unit V Viscosity **(6 hours)**

Viscous Force – Coefficient of Viscosity – Poiseuille's Formula – Determination of Coefficient of Viscosity of Water by Poiseuille's Method – Stokes Formula – Motion of the Sphere through a viscous Liquid – Determination of η by Stokes Method – Variation of Viscosity with Temperature.

Text Book

1. P.R. Sasi Kumar.***Applied Physics.*** Chennai: Scitech Publications (India) Pvt. Ltd . First Reprint 2007.
   Unit I Chapter 1 – 1.1 – 1.10
   Unit II Chapter 6 – 6.1 – 6.7
   Unit III Chapter 9 – 9.1 – 9.8, 9.10

Unit IV Chapter 10 – 10.1 – 10.8
Unit V Chapter 11 – 11.1 – 11.7

Reference books:

1. A. K. Jha. A Text book of Applied Physics, Vol I. New Delhi: I.K. Publishers (P) Ltd. Second Edition 2009

Section –B Skill component

Contact Hours per semester: **60** **Credits:** 4

1. Study of unit and dimension of basic physical and derived quantities
2. Explanation of examples of energy and power
3. Demonstration of elasticity properties of the materials
4. Demonstration of flow rate of liquid
5. Measurement of viscosity of the liquid

LAB: Energy and General Physics Lab - I
Section –B Skill component

Contact Hours per week: 4 **Credits: 4**
Contact Hours per semester: **75** **Subject Code: B20REP11**

(Practical exam – to be conducted at the end of first semester)

1. Determination of radius of capillary tube using travelling Microscope.
2. Estimation of Errors in Screw Gauge and Vernier Caliper.
3. Determination of radius of the Wire using Screw Gauge.
4. Calculation of radius of cardboard using Vernier Caliper.
5. Determination of young's modulus of the given material of a beam by measuring the elevation of its centre when equally loaded to its ends.
6. Determination of value of the coefficient of viscosity for water using Poiseuille' method.
7. Determination of co-efficient of viscosity of the given liquid by Stoke's method.

INDUSTRIAL VISIT & REPORT

Subject Code: **Credits: 2**

It helps to narrate and compile the information and data that is used to construct and assess the Energy conversation methods
Format: Introduction, review on instrumentation, labours, and processing. Prediction of future of the company

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Semester – II
COMMUNICATIVE ENGLISH - II

Contact Hours per week: 6 **Subject Code: EV15E2**
Contact Hours per semester: **60** (30 Theory + 30 Skill) **Credits:** 4 (2 Theory + 2 Skill)

Course Outcomes:
Students, after successful completion of the course, will be able to
1. Develop the proficiency in speaking and writing for different purposes.
2. Develop the communication skills in English.
3. Understand the nuances of the language.

Unit I – Grammar **6 hours**
i. Concord, Voice, Speech, Article, Preposition
ii. Error Spotting

Unit II – Conversational English **6 hours**
i. Dialogue building on various situations

Unit III – Business English **6 hours**
i. Letter writing (Formal Letters & Resume)
ii. Memo / Notice / Agenda / Minutes Writing
iii. Report writing

Unit IV – Situational Speech **6 hours**
i. Welcome address / Vote of thanks
ii. Group Discussion

Unit V – Writing Skill **6 hours**
i. Describing a thing / place / person
ii. Writing Stories from outline

Note: (Allocation: 24 hours Laboratory, 36 hours theory)
Text Book - Advanced Skills for Communication in English: Book I: V.Jeya Santhi

Reference Books:
Ren and Martin- High school English grammar and composition, BBC CD, TOEFL CD

1. G.Radhakrishna Pillai - *Emerald English Grammar & Composition*, Emera Publishers
2. Board of Editors - *Synergy – Communication in English and Study Skil* Orient Blackswan
3. Dr.S.Vincent - *Let's Speak English (A Course in Spoken Englis* Soundra Publications
4. K.R.Lakshminarayanan, T.Murugavel - *Communication Skills in English*, SciTech Publicatio Chennai.
5. G.Radhakrishna Pillai, K.Rajeevan - *Spoken English for You: Level One* Emerald Publisher
6. Bikram K.Das - *Functional Grammar and Spoken and Writt Communication in English*, Orient Longman Pvt., Ltd.
7. A.R.Thorat, B.S.Valke, S.B.Gokhale - *Enriching Your Competence in English* Orient Longm Pvt. Ltd.

Section –B Skill component

Contact Hours per semester: **30** **Credits: 2**

1. Enriching the students' knowledge in the English language.
2. Equipping the student with necessary skills for employment
3. Preparing students for career in media
4. Developing the ability of all students to read, write, listen, speak and think critically
5. Providing students with advanced skills in writing, reading and reasoning.

Mathematics II

Contact Hours per week: 6 **Subject Code: B20RET21**
Contact Hours per semester: 90 (60 theory + 30 Skill) **Credits: 6 (**4 theory + 2 Skill**)**

Course Outcomes:
Students, after successful completion of the course, will be able to

- Learn about algebra of matrices, basics of sampling techniques

Unit I **(12 Hours)**
Matrices: Types of Matrices – Addition and multiplication of matrices – simple propertie

Unit II **(12 Hours)**
Statistical Inference: Introduction – procedure of testing hypothesis - standard error and sampling distribution- estimation

Unit III **(12 Hours)**
Test Of Significance For Small Samples: Student's t- distribution – To test the significance of the mean of a random sample –Testing difference between means of 2 samples (independent)- Testing difference between means of 2 samples (dependent samples)

Unit IV **(12 Hours)**
Theoretical distribution: Binomial distribution – Poisson distribution

Unit V **(12 Hours)**
Chi-square test: Degrees of freedom – Test of goodness of fit – Test of independence – Yates correction
[All units are from text books only. Include the theory parts without proof and derivations. Problems only]

Text Books

1. R.S.N. Pillai and V. Bagavathi – Statistics, Sultan Chand & sons
2. S.P.Gupta , Statistical Methods, Sultan Chand & sons , Thirty-seventh Revised Edition, 2008.
3. S.Arumugam and A.Thangapandi Isaac, Modern Algebra, SCITECH Publications.

Reference Books:

1. S.P. Gupta, Business statistics
2. Sancheti kapoor, Statistic: Theory, Methods and Application

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ENVIRONMENTAL STUDIES

Contact Hours per week :2 **Subject Code: U1ES21**
Contact Hours per semester: 30 **Credits: 2**

Course Outcomes:
Students, after successful completion of the course, will be able to

- Learn the basic of environment
- Provide adequate knowledge of atmosphere.
- Get knowledge about eco system and energy flow.

Unit – I Concept and scope of environmental science (6 Hours)
Environmental segments: Atmosphere, Hydrosphere, Lithosphere and biosphere – natural cycles of environment: endogenic and exogenic cycles –hydrological cycle – carbon cycle and oxygen cycle.

Unit – II Atmosphere (6 Hours)
Atmosphere structure – composition of atmosphere – evolution of the atmosphere – particles, ions and radicals in the atmosphere – Chemical and photo chemical reactions in the atmosphere: oxygen and ozone chemistry – Biological components of atmosphere.

Unit –III Eco system and Energy flow (6 Hours)
Eco system: Classification of Eco system – Components of Ecosystem – Energy flow, Energy pyramid in the Ecosystem – nutrient flow (nitrogen cycle and phosphorous cycle). Food chain & Food web, Community ecology and population ecology.

Unit – IV Lithosphere (6 Hours)
Soil-Types of soil, Soil components, Soil texture, flora and fauna of soil, ecological succession.

Unit – V Environmental Law (6 Hours)
Environment (Protection) Act, (1986) and Rules; Water Prevention and Control of Pollution act, 1974, Air prevention and control of pollution Act, 1981, Salient features of wildlife (Protection) Act.1972, Sanctuaries, National Park, (Section 18 to 38), Industrial regulation act.

Suggested Books for study

1. A.K.De, Environmental chemistry (seventh edition), 2010, New age International Publishers New Delhi.
2. Dr.A.Ravikrishnan, Environment science and engineering. Sri Krishna Hi Tech publishing company PVT Limited.

Suggested Books for Reference and Further Readings

1. Benny Joseph, Environment science and engineering, Tata McGraw-Hill publishing Company limited, New Delhi, 2006.
2. Stanley E.Manahan, Environmental Chemistry, Seventh Edition, Lewis Publishers, Newyork.
3. Trivedi, R.K. (2010) Handbook of Environmental Laws, Acts, Guidelines, Compliance and Standards, Vol I & II, B.S. Publications, Hyderabad.

BASIC OF SOLAR ENERGY

Contact Hours per week: 6 **Subject Code: B20RET22**
Contact Hours per semester: **90** (30 Theory + 60 Skill) **Credits:** 6 (2 Theory + 4 Skill)

Section- A: Theory

Course Outcomes:

Students, after successful completion of the course, will be able to

- Know the Basic Solar Radiation
- Learn about the Solar Radiation Geometry
- Understand the Estimation of solar Radiation
- Get knowledge on Radiation Measuring Instruments
- Acquire the knowledge of calibration of Radiation Measuring Instruments

Unit I Solar Radiation **(6 hours)**

Introduction – The Sun as the Source of Radiation – The Earth and Solar Constant – Spectral Distribution of Extraterrestrial Radiation – Variation of Extraterrestrial Radiation.

Unit II Solar Radiation Geometry **(6 hours)**

Basic Earth – Sun Angles – Solar Time and the Equation of Time – Depletion of Solar Radiation by the Atmosphere – Diffuse Radiation at the Ground.

Unit III Estimation of Solar Radiation **(6 hours)**

Average Daily Global Radiation – Average Daily Diffuse Radiation – Estimation of Hourly Global and Diffuse Solar Radiation – Angle of incidence on Horizontal and inclined planes.

Unit IV Radiation Measuring Instruments **(6 hours)**

Radiation Measuring Instruments - Abbot silver disc Pyrheliometer – Linke-Feussner Pyrheliometer – Eppley Normal Incidence Pyheliometer – The Moll-Gorezynski Pyranometers – The Eppley 180^0 Pyranometer – Photovoltaic Silicon pyranometer.

Unit V Calibration and Standardization **(6 hours)**

Calibration of Pyrheliometer – Determination of the Calibration Constant – Calibration of Pyranometer – Duration of Sunshine Hours – Solar Radiation Data.

Text Book

H.P. Garg, J. Prakash. Solar Energy Fundamentals and Applications. New Delhi: Tata Mcgraw Hill (P) Ltd. Eleventh Reprint, 2009.

Unit I Chapter 1 – 1.1 – 1.5
Unit II Chapter 1 – 1.6 – 1.9
Unit III Chapter 1 – 1.10
Unit IV Chapter 1 – 1.14
Unit V Chapter 1 – 1.17 – 1.19

References:

1. G.D.Rai. Non Conventional Energy Sources. New Delhi: Kanna Publishers. Fifth Edition, Reprint 2012.

Section- B: Skill

Contact Hours per semester: **60** **Credits:** 4

1. Study about solar radiation from the sun
2. Preparing the report of solar radiation Geometry
3. Estimating the various solar radiation in our college campus
4. Measurement of solar intensity using lux meter
5. Preparing the report of solar radiation data

APPLIED PHYSICS II

Contact Hours per week: 6 **Credits:** 6 (2 Theory + 4 Skill)
Contact Hours per semester: **90** (30 Theory + 60 Skill) **Subject Code: B20RET23**

Section- A: Theory

Course Outcomes:

Students, after successful completion of the course, will be able to

- Acquire the Knowledge of Heat Energy
- Learn about Thermal Expansion and its applications
- Get the Knowledge of Heat Transfer Mechanism
- Learn about the Evaporation and Boiling properties and its applications
- Understand the Reflection and Refraction of Light.

Unit I Heat Energy (6 hours)

Introduction – Frictional Heating – Specific Heat Capacity - Specific Heat Capacity by an Electrical Method – A Basic Equation – Different Specific Heat Capacity

Unit II Expansion (6 hours)

Demonstration of Expansion – Large Forces Involved in the Expansion of a Solid – Expansion – Friend or Foe – Linear Expansivity – Bimetallic Strip – Calibration of a Mercury Thermometer – The Clinical Thermometer.

Unit III Transfer of Heat Energy (6 hours)

Introduction – Conduction – An Explanation of Conduction – Convection – Radiation – Reflection and Refraction of Radiation – Emitter and Absorbers of Radiation – The Vacuum Flask — The Green House Effect – Hot Water and Central Heating.

Unit IV Change of State (6 hours)

Latent Heat – Measuring Specific Latent Heat – When a Liquid Evaporates, it Cools – Distinction between Evaporation and Boiling – The body Cooling System and Refrigerators – An Increase in Pressure Lowers the Melting Point – A Decrease in Pressure Lowers the Boiling Point – Pressure Cooker

Unit V Reflections and Refractions (6 hours)

Rays of light – Laws of Regular Reflection – Uses of Plane mirrors – Diffused Reflection – Refraction: Introduction – Refraction at an Air- Glass Interface – Refractive Indices – Internal Reflection – Some Application of Total Internal Reflections.

Text Book

1. H.J.P. Keighley. ***Mastering Physics*** London: The Macmillan press Ltd. 1986.
   Unit I Chapter 8 – 8.1 – 8.6
   Unit II Chapter 9 – 9.1 – 9.7
   Unit III Chapter 11 – 11.1 – 11.8, 11.10, 11.11
   Unit IV Chapter 12 – 12.1 -12.6, 12.8, 12.9
   Unit V Chapter 14 – 14.1 – 14.5
   Chapter 15 – 15.1 – 15.3, 15.5, 15.6

References:

1. A. K. Jha. A Text book of Applied Physics, Vol I. New Delhi: I.K. Publishers (P) Ltd. Second Edition 2009

Section –B Skill component

Contact Hours per semester: **60** **Credits:** 4

1. Demonstration of Specific Heat Capacity by an Electrical Method.
2. Demonstration of linear expansivity of the materials.

3. Study about the reflection, refraction and green house effet.
4. Study about the relation of pressure and temperature
5. Demonstration of total internal reflections.

LAB: ENERGY AND GENERAL PHYSICS -II

Contact Hours per week: 4 **Credits:** 4
Contact Hours per semester: **75** **Subject Code: B20REP21**

Section –B Skill component

1. Measuring the illuminance of different places of college by lux meter
2. Study of solar radiation using Sun Meter
3. Determination of Solar Constant
4. Determine the thermal conductivity of card board using lee's disc method.
5. Measuring the air Flow Rate using anemometer
6. Verify the Snell's Law
7. Study of Electrical Energy Usage in a building

INDUSTRIAL VISIT & REPORT

Credits: 2 **Subject Code: B20REIV2**

It helps to narrate and compile the information and data that is used to construct and assess about the Energy Conservation methods

Format: Introduction, review on instrumentation, labours, and processing. Prediction of future of the company

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COURSE NAME: **NME – NCC**
(*For those who admitted in June 2018 and later*)

V SEMESTER

Semester	Part	Subject	Hours	Credits	Int+Ext = Total	Subject Code
V	NME 1	NCC - NON MAJOR ELECTIVE PAPER – I	2	2	25+75=100	U2NCN51
VI	NME 2	NCC - NON MAJOR ELECTIVE PAPER – II	2	2	25+75=100	U2NCN61

PART IV SEMESTER – V
NON MAJOR ELECTIVE PAPER - I
N2N01 NATIONAL CADET CORPS - PAPER I
(*For those who admitted in June 2018 and later*)

Contact hours per week: 02 **Subject Code: U2NCN51**
Contact hours per semester: 30 **Credits: 2**

Course Outcomes:

Students, after successful completion of the course ,will be able to
CO1 : Acquire knowledge about the motto, aim and an administration pattern of NCC
CO2 : Improve their skills in drill and weapon training
CO3 : Imbibe the values of patriotism
CO4 : Comprehend the values of leaders and Personality development
CO5 : Understand the concept of disaster management

UNIT: I NCC ORGANIZATION (6 Hours)

National Cadet Corps : Motto and aim - administrative and organizational structure – NCC flag. – Rank promotions of NCC cadets. Cadet Welfare Society – Career opportunities for NCC cadets – Certificate Exam in NCC – B & C Certificates – Eligibility and Benefits.

UNIT: II DRILL AND WEAPON TRAINING (6 Hours)

Drill : Aims of drill - Types of drill - foot drill and arms drill. Word of commands. Rifles used in NCC: Parts and characteristic features of 0.22, 7.62 mm SLR, LMG and INSAS Rifles.

UNIT: III NATIONAL INTEGRATION (6 Hours)

National unity: Importance – factors promoting national integration - hindrances in national integration - methods to overcome hindrances. Religions in India and holy places of religions.

UNIT: IV LEADERSHIP AND PERSONALITY DEVELOPMENT (6 Hours)

Leadership traits: Types of leaders - values of leaders - duties of good citizens – methods of developing leadership qualities. Personality traits – good personality and factors influencing personality.

UNIT: V DISASTER MANAGEMENT (6 Hours)

Disasters: Types – Natural and manmade disasters. Role of NCC cadets in disaster management. First aid: Importance - First aid kits and equipments – first aid for snake bite, sun stroke and drowning.

**** Cadets should attend a field visit to training academy.**

HAND BOOK

1. Ramasamy, R. "NCC Guide – Army Wing", Priya Publication, Karur, 2012.

REFERENCE BOOK

2. Misra, R.C., "A Hand Book of NCC", Kanti Prakashan, Etawah, 2009.

PART IV SEMESTER – VI
NON MAJOR ELECTIVE PAPER - II
N3N01 NATIONAL CADET CORPS - PAPER II
(*For those who admitted in June 2018 and later*)

Contact hours per week: 02 **Subject Code: U2NCN61**
Contact hours per semester: 30 **Credits: 2**

Course Outcomes:

Students, after successful completion of the course ,will be able to
CO1 : Know about the various types of map and map reading techniques
CO2 : Understand the various tactics in the war field
CO3 : Comprehend the Indian Army and types of commands
CO4 : Be aware of social activities and experience the adventure activities
CO5 : Be aware of health and sanitation

UNIT: I MAP READING (6 Hours)

Maps-types and uses- Scale and Grid system – types of North-types of bearing-service protractor-compass- conventional signs – setting the map – finding own position-Map to Ground- Ground to Map.

UNIT: II FIELD CRAFT AND BATTLE CRAFT (6 Hours)

Grounds : Types of grounds - types of cover - over and under estimation - judging distances and types of indication of targets. Section formation: Types and organization. Patrolling: Types and stages-Ambush.

UNIT: III MILITARY AND INFANTRY (6 Hours)

Army commands – service branches - fighting arms – supporting arms – coordinating forces for army Wars –Formation of Army

UNIT: IV SOCIAL SERVICES AND ADVENTURE ACTIVITIES (6 Hours)

Social Services**:** Aims and types - problems in society. Role of NCC cadets towards the society. Adventure Activities – Aim – Types (Trekking and Cycling).

UNIT: V HYGIENE AND SANITATION (6 Hours)

Hygiene: Definitions – personal hygiene - camp sanitation. Important human diseases: Causative agent – mode of transmission and preventive measures of malaria and HIV.

**** Adventure Activities – Cadets should engage in any of the following: 1. Cycling, 2. Trekking.**

HAND BOOK

1. Ramasamy, R. "NCC Guide – Army Wing", Priya Publication, Karur, 2012.

REFERENCE BOOK

2. Misra, R.C., "A Hand Book of NCC", Kanti Prakashan, Etawah, 2009.

ANNEXURE – III

Annexure – III

The new subject codes allotted to the courses in the 1st year PG programmes.

M.A. Tamil	
இலக்கணம் 1 - (தொல்காப்பியம்-எழுத்ததிகாரம்)	P19TAC11
இக்கால இலக்கியம்	P19TAC12
சிற்றிலக்கியம்	P19TAC13
தமிழர் வரலாறும் பண்பாடும்	P19TAC14
மக்கள் தகவல் தொடர்பியல்	P19TAE11
இலக்கணம் 2 - (தொல்காப்பியம்- சொல்லதிகாரம்)	P19TAC21
உரையாசிரியர்களும் உரைமரபுகளும்	P19TAC22
அற இலக்கியம்	P19TAC23
இலக்கியத் திறனாய்வும் அணுகுமுறையும்	P19TAC24
சமய இலக்கியம்	P19TAC25
திரைப்படக் கலையும் விமரிசனமும்	P19TAN21
M.Com. CA	
Advanced Business Statistics	P19CCC11
Modern Banking	P19CCE11
Advanced Cost Accounting	P19CCC12
E-Commerce	P19CCC13
Lab: Multimedia Lab	P19CCP11
Operations Research	P19CCC21
Advanced Financial Accounting	P19CCC22
Security Analysis and Portfolio Management	P19CCE21
Computerized Accounting	P19CCC23
LAB: Computerized Accounting	P19CCP21
Retail Marketing	P19CCN21
M.Sc. Microbiology	
General Microbiology & Microbial Diversity	P19MBC11
Biochemistry	P19MBC12
Microbial Physiology	P19MBC13
LAB: General Microbiology and Microbial Diversity	P19MBP11
LAB: Microbial Biochemistry and Microbial Physiology	P19MBP12

Food Microbiology, Food Safety and Quality Management	P19MBE11
Immunology	P19MBC21
Medical Microbiology	P19MBC22
Molecular Biology and Microbial Genetics	P19MBC23
LAB: Medical Microbiology and Immunology	P19MBP21
LAB: Molecular Biology and Microbial Genetics	P19MBP22
Personal Health & Hygiene	P19MBN21
M.Sc. Computer Science	
Advanced C Programming	P19CSC11
Data Structures and Algorithms	P19CSC12
Theory of Computation	P19CSC13
LAB: Data Structures Using C Pointer	P19CSP11
LAB: Programming in DOT NET	P19CSP12
DOT NET Programming	P19CSE11
J2EE Programming	P19CSC21
Computer Architecture and Parallel Processing	P19CSC22
Relational Database Management Systems	P19CSC23
LAB: RDBMS	P19CSP21
LAB: J2EE Programming	P19CSP22
Data Management Techniques	P19CSN21
M.Sc. Information Technology	
Advanced C Programming	P19NTC11
Operating System Design	P19NTC12
Data Structures and Algorithms	P19NTC13
LAB: Data structure using C Pointer	P19NTP11
LAB: Web Designing	P19NTP12
Computer Networking Security / Cyber Forensics	P19NTE11 / P19NTE12
Advanced Java Programming	P19NTC21
Software Testing	P19NTC22
Python Programming	P19NTC23
LAB: Advanced Java Programming	P19NTP21
LAB: Python Programming	P19NTP22
IT and Data Computations	P19NTN21

ANNEXURE – IV

Annexure – IV

The new subject codes allotted to the courses in the 2nd year PG programmes

M.A. Tamil	
இலக்கணம் தொல்-பொருள் I	P19TAC31
காப்பிய இலக்கியம்	P19TAC32
ஆய்வு நெறிமுறைகள்	P19TAC33
தமிழ் இலக்கிய வரலாறு	P19TAC34
நாட்டுப்புறவியல்	P19TAE31
இலக்கணம் தொல் - பொருள் II	P19TAC41
பண்டை இலக்கியம்	P19TAC42
இந்திய இலக்கியம்	P19TAC43
இலக்கியங்களும் இயக்கங்களும்	P19TAC44
ஆய்வேடு-வாய்மொழித்தேர்வு	P19TA4PV
M.A. English	
Nobel Laureates in English	P19ENC31
Women's Writings in English	P19ENC32
Australian Literature	P19ENC33
World Classics in Translation	P19ENC34
An Introduction to Linguistics	P19ENE31
Diaspora Writings	P19ENC41
Teaching of English Language and Literature	P19ENC42
Research Methodology	P19ENC43
Literature and Gender Studies	P19ENC44
Project Work	P19EN4PV
M.A. History	
Socio-cultural History of Tamilnadu (1800-1967 A.D.)	P19HSC31
Trends in Historical Writing	P19HSC32
History of Europe (1453-1789 A.D.)	P19HSC33
Ideas and Movements (From 18th Century to 20th Century)	P19HSC34

History of World Civilization up to 1453 A.D.	P19HSE31
Contemporary History of India (1947-2000 A.D.)	P19HSC41
Women Rights Movements in Tamilnadu (1900-2005)	P19HSC42
Historical Research Methodology	P19HSC43
International Relations (1945-2000 A.D.)	P19HSC44
Project Work	P19HS4PV
M.Com.	
Direct Taxes – I	P19CMC31
Retail Management	P19CMC32
Indirect Taxes	P19CMC33
Strategic Management	P19CMC34
Elective – II – Corporate Accounting	P19CME31
Financial Management	P19CMC41
Direct Taxes - II	P19CMC42
Business Ethics Corporate Governance	P19CMC43
Project	P19CM4PV
Elective – III – Indian Accounting Standards & Corporate Reporting	P19CME41
M.Sc. Mathematics	
Field Theory	P19MAC31
Complex Analysis	P19MAC32
Numerical Methods	P19MAC33
Measure Theory	P19MAC34
a)Integral Equations b)Classical Mechanics	P19MAE31 P19MAE32
Optimization Techniques	P19MAC41
Functional Analysis	P19MAC42
Combinatorics	P19MAC43
PROJECT	P19MA4PV
a)Applications of Graph Theory b)Advanced Topology	P19MAE41/ P19MAE42

c)Stochastic Processes	P19MAE43
M.Sc. Physics	
Core 7 - Solid State Physics I	P19PHC31
Core 8 - Quantum Mechanics - II	P19PHC32
Core 9- Nuclear and Particle Physics	P19PHC33
Major Elective-Fiber Optic Communication / Applied Optics	P19PHE31/ P19PHE32
Core Lab4-LAB:Digital Electronics & General Physics	P19PHP31
Core10- Solid State Physics II	P19PHC41
Core11-Molecular Spectroscopy	P19PHC42
Core12- Thermodynamics and Statistical Mechanics	P19PHC43
Major Elective-Nanophysics/ Biophysics	P19PHE41/ P19PHE42
Core Lab 5: Project& Viva-voce	P19PH4PV
M.Sc. Chemistry	
Core Subject VII-Organic Chemistry III	P19CHC31
Core Subject VIII-Inorganic Chemistry III	P19CHC32
Core subject IX-Physical Chemistry III	P19CHC33
Core Lab IV-LAB: Organic Chemistry Practical II	-
Core Lab V-LAB: Inorganic Chemistry Practical II	-
Core subject X - Analytical Methods in Chemistry	P19CHC34
Major Elective 2- Medicinal and Pharmaceutical Chemistry / Polymer Chemistry	P19CHE31/ P19CHE32
Core subject XI-Organic Chemistry IV	P19CHC41
Core subject XII-Inorganic Chemistry IV	P19CHC42
Core subject XIII-Physical Chemistry IV	P19CHC43
Core Lab IV-LAB: Organic Chemistry Practical II	P19CHP41
Core Lab V-LAB: Inorganic Chemistry Practical II	P19CHP42
Major Elective 3: Project & Viva-voce	P19CH4PV

M.Sc. Botany	
Microbiology, Fungi and Plant Pathology	P19BYC31
Biotechnology	P19BYC32
Biochemistry	P19BYC33
Lab V –LAB: Microbiology, Fungi and Plant Pathology and Biotechnology	P19BYP31
Lab VI – LAB: Biochemistry	P19BYP32
Biodiversity & Conservation	P19BYE31
Plant Physiology	P19BYC41
Bioinformatics and Biostatistics	P19BYC42
Developmental Botany	P19BYC43
Lab VII–LAB: Plant Physiology	P19BYP41
Lab VIII-LAB: Bioinformatics and Biostatistics, Developmental Botany	P19BYP42
Project work	P19BY4PV
M.Sc. Zoology	
Immunology	P19ZYC31
Developmental Biology	P19ZYC32
Evolution	P19ZYC33
Research Methodology	P19ZYE31
LAB: Immunology	P19ZYP31
LAB: Developmental Biology	P19ZYP32
Microbiology	P19ZYC41
Animal Physiology	P19ZYC42
Biotechnology	P19ZYC43
Project	P19ZY4PV
LAB: Microbiology	P19ZYP41
LAB: Animal Physiology	P19ZYP42
M.C.A.	
Cryptography and Network Security	P19CAC31

Principles of Compiler Design	P19CAC32
Cloud Computing	P19CAC33
Internet of Things	P19CAC34
Digital Image Processing/ Embedded Systems/ Android Programming	P19CAE31/ P19CAE32/ P19CAE33
LAB :Android Programming	P19CAP31
LAB : Dot Net Programming	P19CAP32
Project and Viva-voce	P19CA4PV

M.Com. CA	
Direct Taxes	P19CCC31
Research Methodology	P19CCE31
Special Accounts	P19CCC32
VB with Oracle	P19CCC33
LAB: Client Server	P19CCP31
Financial Management	P19CCC41
Goods and Services Tax and Customs Duty	P19CCC42
Financial Derivatives	P19CCC43
Web Design	P19CCC44
Project work & viva-voce	P19CC4PV

M.Sc. Microbiology	
Environmental and Agricultural Microbiology	P19MBC31
Genetic Engineering	P19MBC32
Fermentation Technology	P19MBC33
LAB: Environmental, Agricultural Microbiology and Fermentation Technology	P19MBP31
LAB: Genetic Engineering	P19MBP32
Bioinformatics	P19MBE31
Research Methodology	P19MBC41
Microbial Nanotechnology	P19MBE41

Project & Viva-voce	P19MB4PV
M.Sc. Computer Science	
Data Communication and Networks	P19CSC31
Python Programming	P19CSC32
Principles of Compiler Design	P19CSC33
LAB: Python Programming	P19CSP31
LAB: Open Source Programming	P19CSP32
Wireless Communication/ Operating System Design / Computer Networking Security	P19CSE31/ P19CSE32/ P19CSE33
Neural Networks	P19CSC41
Data Mining and Warehousing	P19CSC42
Project & Viva-voce	P19CS4PV
M.Sc. Information Technology	
Android Programming	P19NTC31
Data Mining	P19NTC32
Principles of Compiler design	P19NTC33
LAB: Android Programming	P19NTP31
LAB: Network	P19NTP32
TCP/IP Protocols / Wireless Sensor Networks	P19NTE31/ P19NTE32
Text Mining	P19NTC41
Cloud Computing	P19NTC42
Internet of Things	P19NTC43
Project & Viva - Voce	P19NT4PV

MBA	
Operations Research	P19MSC31
Workshop on Research Methods	P19MSW31

Research Methodology	P19MSC33
Major Elective 1	Refer Elective Table
Major Elective 2	Refer Elective Table
Minor Elective 1	Refer Elective Table
Workshop on Employability Skills	P19MSW32
Legal Aspects of Business	P19MSC41
Strategic Management	P19MSC42
International Business	P19MSC43
Major Elective 3	Refer Elective Table
Major Elective 4	Refer Elective Table
Minor Elective 2	Refer Elective Table
Final Project &Viva -Voce	P19MS4PV

ELECTIVES GROUPS

FINANCE ELECTIVES (EF)

Course Title	Subject Code
Project Management	P19MSE31F
Indian Capital Market	P19MSE32F
Investor Education & Protection Products	P19MSE33F
Banking Services Operations	P19MSE41F
Financial Services: Financing & Investing Solutions	P19MSE42F
Security Analysis	P19MSE43F
Workshop on Financial Accounting With Tally	P19MSE4FP

MARKETING ELECTIVES (EM)

Course Title	Subject Code
Consumer Behavior	P19MSE31M
Advertising Management	P19MSE32M
Digital Marketing	P19MSE33M
Services Marketing	P19MSE41M
Retail Management	P19MSE42M
Workshop On Sales And Marketing Strategies	P19MSE4MP

HUMAN RESOURCESS ELECTIVES (EH)

Course Title	Subject Code
Human Resources Development	P19MSE31H
Industrial Relations	P19MSE32H
Training & Development	P19MSE33H
Counselling Skills For Managers	P19MSE41H
Conflict and Negotiation	P19MSE42H
Performance Management	P19MSE43H

SYSTEMS ELECTIVES (ES)

Course Title	Subject Code
Software Project Management	P19MSE31S
RDBMS/ Client Server Computing (ORACLE)	P19MSE32S
Enterprise Resource planning	P19MSE33S
Data Mining and Data Warehousing	P19MSE41S
Networking Management and Information security	P19MSE42S
Web page Designing using PHP 6 & MySQL 5	P19MSE43S

OPERATIONS ELECTIVES (EO)

Course Title	Subject Code
Purchase And Material Management	P19MSE31R
Supply Chain Management	P19MSE32R
Total Quality Management	P19MSE33R
Logistics Management	P19MSE41R
Business Process Management	P19MSE42R
Production Planning And Inventory Control	P19MSE43R

Ministry of Education
Government of India

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Certificate

NATIONAL INSTITUTIONAL RANKING FRAMEWORK

INDIA RANKINGS 2021

Virudhunagar Hindu Nadars Senthikumara Nadar College, Virudhunagar
Ranked 47 in Colleges Category

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