THE MADURA COLLEGE (AUTONOMOUS)

(Affiliated to Madurai Kamaraj University, Reaccredited (3rd cycle) with "A" Grade by NAAC)

TPK Road, Madurai – 625 011, Tamil Nadu

www.maduracollge.edu.in

ACADEMIC COUNCIL

26.08.2020

ESTD : 1889

Learning Shines with Righteousness

BOOK 2 of 2
(Corrected Copy)

(Syllabi Pages: 430-766)

THE MADURA COLLEGE (AUTONOMOUS)

(Affiliated to Madurai Kamaraj University, Reaccredited (3rd Cycle) with "A" Grade by NAAC)

Ordinary Meeting of the Academic Council

Venue	:	**Online at Google Meet**
Date	:	**26.08.2020**
Time	:	**10.00 a.m.**

Members are requested to bring with them this copy as well as the copy of the appendices.

Dr.R.Eswaran
Member Secretary

Dr.J.Suresh
Principal & Chairman

THE MADURA COLLEGE (AUTONOMOUS)

(Affiliated to Madurai Kamaraj University, Reaccredited (3rd Cycle) with "A" Grade by NAAC)

ACADEMIC COUNCIL

Date: 14.08.2020

<u>NOTICE</u>

An ordinary online meeting of the Academic Council will be held on 26.08.2020 (Wednesday) from 10.00a.m. through Google Meet. Resolutions from the Board of Studies and Private resolutions may be submitted to the Member Secretary, Academic Council (eswaran@maduracollege.edu.in) on or before 17th August 2020. Last date for the withdrawal of resolution will be 19th August 2020 upto 3.30 pm.

The agenda and resolutions to be discussed will be made available to the members sufficiently in advance.

Dr.R.Eswaran
Member Secretary

Dr.J.Suresh
Principal & Chairman

THE MADURA COLLEGE (AUTONOMOUS)
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ACADEMIC COUNCIL

MEMBERS IN THE ACADEMIC COUNCIL

Dr.J.Suresh
The Principal & Chairman

Dr.R.Eswaran
Member Secretary

EXTERNAL MEMBERS

Er.N.S.Krishnan,
President,
Madura College Board,
Madurai.

C.A.S.Natanagopal,
Secretary,
Madura College Board,
Madurai.

Sri.N.Anand Srinivasan,
Treasurer,
Madura College Board,
Madurai.

Dr.V.Chinniah,
Professor & Head, Department of Management Studies,
School of Business studies,
Madurai Kamaraj University,
Madurai -625 021.

Dr.R.Sudha,
Professor & Head, Department of French,
School of English and Foreign Languages,
Madurai Kamaraj University,
Madurai -625 021.

Dr.H.Shakila,
Professor & Head, Department of Molecular Microbiology,
School of Biotechnology,
Madurai Kamaraj University,
Madurai -625 021.

Dr.S.Vaidhya Subramanian,
Dean, (Member representing Education)
SASTRA University,
Tirumalai Samudiram,
Thanjavur – 613 401.

Sri.S.Sankaran,
(Member representing Profession)
Director – Madura College Board,
Madurai.

Sri.R.Sridharan,
(Member representing Profession)
Director – Madura College Board,
 Madurai.

Sri.K.K.Raman,
(Member representing Industry)
President,
Sundaram Industries (TVS Rubber)
Madurai.

INTERNAL MEMBERS

Boards of Studies Chairmen	-	All Heads/Coordinators of the Department
Members of Academic Council	-	All Permanent Faculty Members
Special invitees	-	Nominated by Chairman

(Teachers on probation/Senior Faculties of SF stream)

THE MADURA COLLEGE (AUTONOMOUS)
(Reaccredited with "A" Grade by NAAC)

ACADEMIC COUNCIL

AGENDA FOR THE MEETING ON 26.08.2020

1. Prayer

2. Welcome Address : The Chairman, Academic Council

3. Confirmation of the Minutes of the previous Academic Council Meeting held on 10.07.2019

4. Resolutions of Boards of Studies from various Departments

5. Any other subjects brought forward by the Chairman

6. Observation & Remarks by the External Members

7. Vote of Thanks : Member Secretary

8. National Anthem

CONTENTS

Sl. No.	Particulars	Page No.
I.	CONFIRMATION OF THE MINUTES OF THE PREVIOUS ACADEMIC COUNCIL MEETING HELD ON 10.07.2019	i
II.	BUSINESS BROUGHT FORWARD BY THE CHAIRMAN	iv
III.	RESOLUTIONS BROUGHT FORWARD BY THE HEADS OF THE DEPARTMENT	iv
	1. FROM THE BOARD OF STUDIES IN TAMIL 2. FROM THE BOARD OF STUDIES IN HINDI 3. FROM THE BOARD OF STUDIES IN SANSKRIT 4. FROM THE BOARD OF STUDIES IN ENGLISH 5. FROM THE BOARD OF STUDIES IN ECONOMICS 6. FROM THE BOARD OF STUDIES IN COMMERCE 7. FROM THE BOARD OF STUDIES IN MATHEMATICS 8. FROM THE BOARD OF STUDIES IN STATISTICS 9. FROM THE BOARD OF STUDIES IN PHYSICS 10. FROM THE BOARD OF STUDIES IN CHEMISTRY 11. FROM THE BOARD OF STUDIES IN BOTANY 12. FROM THE BOARD OF STUDIES IN ZOOLOGY 13. FROM THE BOARD OF STUDIES IN COMPUTER SCIENCE 14. FROM THE BOARD OF STUDIES IN INFORMATION TECHNOLOGY 15. FROM THE BOARD OF STUDIES IN MICROBIOLOGY 16. FROM THE BOARD OF STUDIES IN BIOTECHNOLOGY	
IV.	ANY OTHER SUBJECTS BROUGHT FORWARD BY THE CHAIRMAN	x
	BOOK – I (1-429)	
V.	COURSE STRUCTURE AND SYLLABUS FOR TAMIL	1-49
	COURSE STRUCTURE AND SYLLABUS FOR HINDI	50-61
	COURSE STRUCTURE AND SYLLABUS FOR SANSKRIT	62-89
	COURSE STRUCTURE AND SYLLABUS FOR ENGLISH	90-140
	COURSE STRUCTURE AND SYLLABUS FOR ECONOMICS	141-213
	COURSE STRUCTURE AND SYLLABUS FOR COMMERCE	214-313
	COURSE STRUCTURE AND SYLLABUS FOR MATHEMATICS	314-358
	COURSE STRUCTURE AND SYLLABUS FOR STATISTICS	359-429
	BOOK – II (430-766)	
	COURSE STRUCTURE AND SYLLABUS FOR PHYSICS	430-479
	COURSE STRUCTURE AND SYLLABUS FOR CHEMISTRY	480-523
	COURSE STRUCTURE AND SYLLABUS FOR BOTANY	524-565
	COURSE STRUCTURE AND SYLLABUS FOR ZOOLOGY	566-613
	COURSE STRUCTURE AND SYLLABUS FOR COMPUTER SCIENCE	614-645
	COURSE STRUCTURE AND SYLLABUS FOR INFORMATION TECHNOLOGY	646-683
	COURSE STRUCTURE AND SYLLABUS FOR MICROBIOLOGY	684-729
	COURSE STRUCTURE AND SYLLABUS FOR BIOTECHNOLOGY	730-754
	COURSE STRUCTURE AND SYLLABUS FOR VALUE EDUCATION AND PROFESSIONAL ETHICS ENVIRONMENTAL SCIENCE & GENDER STUDIES	755-766

I. CONFORMATION OF MINUTES OF THE PREVIOUS ACADEMIC COUNCIL MEETING HELD ON 10.07.2019

THE MADURA COLLEGE

(Autonomous, Affiliated to Madurai Kamaraj University, Re-accredited (3rd Cycle) with 'A' Grade by NAAC)

MADUARI -625 011

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MEETING OF THE ACADEMIC COUNCIL

Date: 10.07.2019 (Wednesday)   **Venue: Seminar Hall**   **Time: 02.00 p.m.**

MINUTES OF THE ACADEMIC COUNCIL MEETING

A meeting of the Academic Council was held in the Seminar Hall on Wednesday, 10th July 2019.

Members Present

1) Dr. J. Suresh (Chairman, Academic Council)
2) Dr. R. Eswaran (Member Secretary, Academic Council).
3) Sri. S. Natanagopal (Secretary, MCB)
4) Dr. H. Shakila (University Nominee)
5) Dr. K.M. Rajasekaran (CoE)
6) Dr. K. Muthuvel
7) Dr. S. Dhanasamy
8) Dr. A. Atheeswari
9) Dr. G. Karunakaran
10) Dr. N. Rathinakumar
11) Dr. R. Subramony
12) Dr. Sheela P.Karthick
13) Dr. R. Raja
14) Dr. G. Sivasubramanian
15) Dr. A. Chandra Bose
16) Dr. S. Sudha
17) Dr. D. Bhuvaneswari
18) Dr. A. Vignesh Kumar
19) Prof. S. Venkatesh
20) Prof. S. Murali
21) Dr. S. Theenathayalan
22) Dr. P. Kannan
23) Dr. R. Gopi
24) Dr. V. Sriman Narayanan
25) Dr. S. Karthikeyan
26) Dr. S. Meenakshi
27) Dr. A. Mayilmurugan
28) Dr. S. Selvakumar
29) Dr. K. HemaMalini
30) Dr. Y. Natarajan
31) Dr. C. Thangapandi
32) Dr. K.M. Dharmalingam
33) Dr. G. Marimuthu
34) Dr. V. Ananthaswamy
35) Dr. I. Sahulhamid
36) Dr. U. Karthik Raja
37) Dr. I. Padmavathi
38) Dr. S. Usha
39) Dr. M. Prema Rani
40) Prof. V. Meenakshi Sundaram
41) Prof. T. Vivekanandan
42) Prof. S. Sivaramakrishnan
43) Dr. M. Kavitha
44) Prof. G. Gowri
45) Dr. R. Vishnu Priya
46) Dr. J. Sivasubramanian
47) Dr. P.S. Harikrishnan
48) Dr. P. Gajendran
49) Dr. M. Malarvizhi
50) Dr. S.V. Karthikeyan
51) Prof. S. Vidhyasankar
52) Dr. R. Ramachandran
53) Prof. S. Selvakumar
54) Dr. P. Prasanna
55) Dr. M. Boominathan
56) Dr. M. HasmathFarzana
57) Prof. S. Chella Pandian
58) Dr. P. Krishnan
59) Dr. P. Kannan
60) Dr. S. Karuppusamy
61) Dr. S. Gnaana Saraswathi
62) Prof. V. Meenakshi Sundaram
63) Dr. S. Dinakaran
64) Dr. L.D. Devasree
65) Dr. B. Latha
66) Prof. R. Umasankari
67) Prof. C. Hema

i

1. The meeting was called to order by the Principal-cum-Chairman of the Academic council, Dr. J. Suresh, and the meeting began with the college prayer. The Chairman welcomed Sri. S. Natanagopal, Secretary, Madura College Board and Dr. H. Shakila, University Nominee and all other members of the Academic Council and visitors to the first meeting of Academic council for the academic year 2018-19.

2. The Minutes of the previous Academic Council meeting, held on 31.10.2018, was confirmed and passed.

3. The chairman of the Academic Council brought an Ordinance 1(1) of 2019-20 regarding the conversion of M.A.(Philosophy) and M.A.(Sociology) into M.Com. and M.Sc.(Statistics) respectively under Aided stream from the Academic year 2019-20. He also informed that the courses were approved by the Secretary, Higher Education, Tamil Nadu and The Registrar, Madurai Kamaraj University (MKU).

4. Resolutions **1.1. and 1.2** were moved by **Dr. S. Theenathayalan**, Chairman, Board of Studies in Economics and seconded by **Dr. P. Kannan**. The motion was then thrown open for discussion.

   Sri. S. Natanagopal, Secretary, MCB, initiated the discussion and queried whether the paper introduced was new or replacing the previously passed paper. Dr. S. Theenathayalan answered that as a replacement. Further, he explained about the introduction of certificate course on 'Teaching and Research Aptitude". He elucidated the need and scope of the course. In addition, he proposed that the course would be extended to all students depending upon the demand. He also added that external experts would be invited for teaching a few specialized topics.
   Then, the motion was put to vote and CARRIED.

5. Resolutions **2.1. to 2.3** were moved by **Dr. A. Mayilmurugan**, Chairman, Board of Studies in Commerce and seconded by **Dr. S. Selvakumar**. The motion was then thrown open for discussion.

   Dr. S. Theenathayalan enquired about the fate of M.Com Course in SF stream. Dr. A. Mayilmurugan replied that the admission of first year students to M.Com under SF stream was suspended and might be continued based on demand. Dr. K. Muthuvel suggested to include the syllabus of the M.Com (SF) passed during the Academic councils held on 16.12.2016 and 16.04.2018 as a booklet. Chairman assured that the changes could be made in the corrected copy. Dr. A. Mayilmurugan placed an appeal to the council to rename the department as Post-graduate department of Commerce as the same was decided in the BoS meeting which was unanimously accepted.

   Lots of deliberations happened on the resolution about the MoU with other colleges for staff exchange programs. Dr. S. Theenathayalan explained that taking students to other colleges under exchange programs required permission from the Joint Directorate of Collegiate Education Dr. H. Shakila requested to formulate the standard procedure for the selection of staff under Faculty exchange programme. She also suggested to refer the guidelines followed by the other institutions such as MKU.

   Dr. S. Theenathayalan queried the eligibility criteria for the students to get admitted in the M.Com aided course since our own college offers various specialized programs under B.Com such as Commerce, Banking and Insurance, Professional Accounting, Marketing etc. Chairman explained that the guidelines from MKU had been followed and agreed to provide the eligible criteria in the prospectus. Dr. H. Shakila endorsed the explanation.
   Then, the motion was put to vote and CARRIED.

6. Resolutions **3.1** was moved by **Dr. C. Thangapandi,** Chairman, Board of Studies in Statistics and seconded by **Dr. K.M. Dharmalingam**. The motion was then thrown open for discussion.

   Dr. S. Theenathayalan asked about the qualification of the staff who would handle paper on Economics. Chairman answered that Staff for the Statistics and Mathematics department would soon be recruited and they would handle the papers. Dr. S. Theenathayalan asked about the modalities followed in syllabus framing and Board of Studies (BoS) meeting. Chairman affirmed

that a separate, exclusive BoS was conducted for Statistics and the invitees for the BoS were statisticians from the reputed educational institutions.

Dr. H. Shakila suggested to include Biostatistics as one of the core papers in the curriculum. Chairman agreed to take up the suggestion in the next BoS of Statistics.
Then, the motion was put to vote and CARRIED.

7. Resolutions **4.1. to 4.4** were moved by **Dr. P. Krishnan**, Associate Professor of Botany and seconded by **Dr. V. Sriman Narayanan**, Assistant Professor of Economics & Deputy Controller of Examinations (DCoE). The motion was then thrown open for discussion. All members assented passing the resolutions and the motion was CARRIED.

8. The first addendum resolution was moved by **Prof. S. Murali**, Associate Professor & Head, Department of Hindi and seconded by **Dr. S. Dinakaran**, Associate Professor and Head, Department of Zoology. The motion was then thrown open for discussion.
Then, the motion was put to vote and CARRIED.

9. The second addendum resolution was moved by **Dr. P.S. Harikrishnan**, Associate Professor of Chemistry and seconded by **Dr. P. Gajendran**, Assistant Professor of Chemistry. The motion was thrown open for discussion.

Dr. S. Theenathayalan queried whether the changes effected were based on the TANSCHE norms. Dr. S. Sivaramakrishnan, NAAC Executive Coordinator, answered that the fitment table was prepared during 2009 based on the TANSCHE norms with a few changes to suit our college environment.
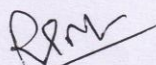Then, the motion was put to vote and CARRIED.

10. The chairman requested the Secretary, Madura College Board and University nominee, to give their observations and remarks.
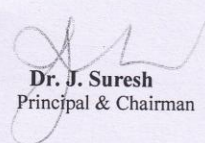
Dr. H. Shakila in her observations appreciated the good preparation of resolutions and proper communication and also cherished the deliberations by the members.

11. The Member Secretary, Dr. R. Eswaran proposed vote of Thanks.

12. The Chairman adjourned the Academic Council after singing of the National Anthem by all.

Dr. R. Eswaran
Member Secretary

Dr. J. Suresh
Principal & Chairman

II. BUSINESS BROUGHT FORWARD BY THE CHAIRMAN

Ordinance 1 (1) of 2020-21

Resolved that the following ordinance 1(1) of 2020-21 of the Ordinances of the chairman of the Academic council be approved and be recommended for consideration of the Governing body of the college.

To introduce an additional section in B.Com (General) in the self-financing stream from the academic year 2020-21 onwards subject to affiliation by the Madurai Kamaraj University.

III. RESOLUTIONS BROUGHT FORWARD BY THE HEADS OF THE DEPARTMENT

1) FROM THE BOARD OF STUDIES OF TAMIL DEPARTMENT
Dr.S.Dhanasamy, Chairman, Board of Studies in Tamil, shall move and **Dr.A.Atheeswari** shall second the following resolutions passed in the Board of Studies meeting held on 18.03.2020.

1.1. Resolved to introduce the revised syllabi for Part-I Tamil (I to IV semesters) with Choice Based Credit System (CBCS) and Outcome Based Education (OBE) pattern, evaluation components and question paper pattern for those students who join B.Sc. and B.A., (Regular and Self) from the academic year 2020-2021 **(pp 1-15)**.

1.2. Resolved to introduce the syllabi for Part-I Tamil (I & II semesters) with CBCS and OBE pattern, evaluation components and question paper pattern for first year students of Commerce who join from the academic year 2020-2021 **(pp 2-4, 16-25)**.

1.3. Resolved to introduce the revised syllabi with CBCS and OBE pattern for I year students of B.A. Tamil who join from the academic year 2020-2021 onwards **(pp 27-49)**.

1.4. Resolved to introduce a new certificate course titled "பேச்சுக்கலை " for all the UG and PG students **(P 26)**.

2) FROM THE BOARD OF STUDIES OF HINDI DEPARTMENT
Prof.S.Murali, Chairman, Board of Studies in Hindi, shall move and **Dr.S.Dinakaran** shall second the following resolutions passed in the Board of Studies meeting held on 18.03.2020.

2.1. Resolved to introduce the revised syllabi for Part-I Hindi (I to IV semesters) with CBCS and OBE pattern, evaluation components and question paper pattern for all the students who join B.A./B.Sc. from the academic year 2020-21 onwards under both Regular and Self Finance Stream **(pp 50-57)**.

2.2. Resolved to introduce the revised syllabi for Part-I Hindi (I & II semesters) with CBCS and OBE pattern, evaluation components and question paper pattern for the students who join B.Com (Aided & SF), B.Com (Professional Accounting-SF), B.Com (Banking & Insurance-SF) & B.Com (Capital Markets-SF) from the academic year 2020-21 onwards **(pp 51-52, 58-61)**.

iv

3) FROM THE BOARD OF STUDIES OF SANSKRIT DEPARTMENT

Prof.P.Manikandan, Chairman, Board of Studies in Sanskrit, shall move and **Prof.S.Murali** shall second the following resolutions passed in the Board of Studies meeting held on 18.03.2020.

3.1. Resolved to introduce the revised syllabi for Part-I Sanskrit (I to IV semesters) with CBCS and OBE pattern, evaluation components and question paper pattern for the students who join B.A. /B.Sc. from the academic year 2020-21 onwards under both Regular and Self Finance Stream **(pp 62-77)**.

3.2. Resolved to introduce the revised syllabi for Part-I Sanskrit (I & II semesters) with CBCS and OBE pattern, evaluation components and question paper pattern for the students who join B.Com (Aided & SF), B.Com (Professional Accounting-SF), B.Com (Banking & Insurance-SF) & B.Com (Capital Markets-SF) from the academic year 2020-21 onwards **(pp 62-64, 78-89)**.

4) FROM THE BOARD OF STUDIES OF ENGLISH DEPARTMENT

Dr.R.Subramony, Chairman, Board of Studies in English, shall move and **Dr.Sheela P.Karthick** shall second the following resolutions passed in the Board of Studies meeting held on 18.03.2020.

4.1. Resolved to introduce revised syllabi for B.A English under CBCS pattern with OBE Model from the academic year 2020-2021 onwards **(pp 106-140)**.

4.2 To introduce part II English for Semester I of all the U.G programmes (B.A., B.Sc. & B.Com.) as per letter received from the Higher Education Secretary (Ref: Higher Education 3282/k2/2020) dated. 04/03/2020. In the event of any delay in receiving the syllabi as proposed in the letter, the department will incorporate the syllabi based on CLIL as prescribed by TANSCHE **(pp 92, 96-100)**.

4.3. Resolved to incorporate part-II English syllabi for Semesters II, III& IV of all the U.G programmes, as prescribed by TANSCHE based on CLIL, from the academic year 2020-2021 onwards **(pp 91-95, 101-105)**.

4.4. Resolved to restructure the syllabus for certificate course on "Spoken English" for the students to be admitted from the academic year 2020-2021 onwards.

4.5. Resolved to include the texts as envisaged by students in their feedback.

5) FROM THE BOARD OF STUDIES OF ECONOMICS DEPARTMENT

Dr.S.Theenathayalan, Chairman, Board of Studies in Economics, shall move and **Dr.P.Kannan** shall second the following resolutions passed in the Board of Studies meeting held on 18.03.2020.

5.1. Resolved to introduce new syllabi for I BA Economics with OBE model under CBCS pattern from the academic year 2020-21 onwards **(pp 141-175)**.

5.2. Resolved to restructure the syllabi for III BA Economics for the students who have been admitted from the academic year 2018-19 **(pp 176-201)**.

5.3. Resolved to introduce common syllabi for Business Economics and International Economics courses for the I year B.Com. Aided and I B.Com. Self-financing (General / Professional Accounting / Banking & Insurance / Capital Markets) for the students to be admitted from the academic year 2020-2021 onwards **(pp 202-213)**.

5.4. Resolved to introduce papers titled Economic Thinkers and Retail Marketing based on feedback of the parents & students for the students who have been admitted during the academic year 2018-2019 **(pp 144, 189, 196-197)**.

5.5. Resolved to follow the pattern of CIA and Summative Examination as prescribed by the academic council for UG programme.

6) FROM THE BOARD OF STUDIES OF COMMERCE DEPARTMENT
Dr.A.Mayilmurugan, Chairman, Board of Studies in Commerce, shall move and D**r.S.Selvakumar** shall second the following resolutions passed in the Board of studies meeting held on 18-03-2020.

6.1. Resolved to approve the Structure and syllabi for III year B.Com (Capital Markets) under SF stream for fifth and sixth semester with internship training for the students who have joined from the academic year 2018-19 onwards **(pp 214-230)**.

6.2. Resolved to approve common syllabi for First year (I & II semester) for all the programmes of B.Com. under Aided and Self Financing Stream for the students who join from the academic year 2020-21 onwards **(pp 231-248)**.

6.3. Resolved to approve a revised OBE curriculum for B.Com. programme structure for each stream and syllabi for the first year B.Com (Aided & SF), B.Com (Professional Accounting-SF), B.Com (Banking & Insurance-SF) & B.Com (Capital Markets-SF) for first & second semesters for the students who join from the academic year 2020-21 onwards **(pp 249-305)**.

6.4. Resolved to approve the syllabus of a Certificate course on "Financial Markets: A Beginners' Module" during the second semester for the students of B.Com (Capital Markets) as add-on course with extra 3 credits for the students who join from the academic year 2020-21 onwards **(pp 311-313)**.

6.5 Resolved to place the suggestions given in the PTA meeting and students' feedback session for discussions in BoS. Based on the discussion in the BoS recent developments in commerce and business arenas were introduced in the curriculum viz., ICT related course, service marketing, Accounting Package with GST and Industrial training & Industrial visit for practical exposure **(pp 223, 228-229, 271-277)**.

6.6. Resolved to ratify the certificate course 'Goods and Services Tax & Accounting Package' offered and conducted for the students for the academic year 2019-20 **(pp 306-308)**.

6.7. Resolved to approve the syllabi for the following two certificate courses with OBE Model from the academic year 2020-21 onwards **(pp 306-310)**.
Goods and Services Tax & Accounting Package
Entrepreneurial Development & Start-ups

7) FROM THE BOARD OF STUDIES OF MATHEMATICS DEPARTMENT
Dr.S.Muthukumar, Chairman, Board of Studies in Mathematics, shall move and **Dr.C.Thangapandi** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

7.1 Resolved to approve the syllabi along with question paper pattern for Internal and External examinations for I B.Sc., Mathematics from the academic year 2020 onwards **(pp 314-354)**.

7.2. Resolved to approve the ratification of the syllabi of the following certificate courses being conducted by Department of Mathematics for all UG and PG students of Madura College from December 2019 onwards **(pp 355-357)**.
1. Certificate course on Visual Basic Programming
2. Certificate course on Decision Making and Investment Analysis.

7.3. Resolved to approve the syllabi for the certificate course titled "Certificate course on Latex" for the PG students of the Madura College from July 2020 onwards **(pp 355, 358)**.

8) FROM THE BOARD OF STUDIES OF STATISTICS DEPARTMENT
Dr.S.Muthukumar, Chairman, Board of Studies in Statistics, shall move and **Dr.C.Thangapandi** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

8.1. Resolved to approve the syllabi along with question paper pattern for internal and external examinations for I B.Sc., Statistics from the academic year 2020-2021 onwards **(pp 359-400)**.

8.2 Resolved to approve the syllabus for II M.Sc., Statistics major students who joined the course from 2020-2021 onwards in aided stream **(pp 401-423)**.

8.3. Resolved to ratify the syllabi of the following certificate course being conducted by Statistics for PG students of Madura College from August 2019 onwards **(pp 424, 426)**.
1. Certificate course on Statistical analysis using R Programming.

8.4. Resolved to introduce the syllabi for certificate courses titled
1. Statistical Packages for Social Sciences.
2. Statistical Data Analysis using Excel.
3. Quantitative Aptitude for Competitive Examinations
   for the PG students of Madura College from 2020-2021 onwards **(pp 424-425, 427-429)**.

9) FROM THE BOARD OF STUDIES OF PHYSICS DEPARTMENT
Dr.R.Saravanan, Chairman, Board of Studies in Physics, shall move and **Dr.M.Prema Rani** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

9.1. Resolved to introduce the curriculum structure based on outcome based education for B.Sc., Physics students who join the course from the academic year 2020-2021 onwards both in aided and in self financed stream **(pp 430-438).**

9.2. Resolved to introduce the revised syllabi based on outcome based education along with the blue prints for question papers for I year B.Sc., Physics students who join the course from academic year 2020-2021 onwards both in aided and in self finance stream **(pp 440-460).**

9.3. Resolved to introduce the ancillary syllabi based on outcome based education along with the blue prints for question papers for B.Sc., Mathematics and B.Sc., Chemistry students who join the course from academic year 2020-2021 onwards both in aided and in self financed stream **(pp 439, 461-476)**.

9.4. Resolved to ratify the syllabi for the value added courses (i) Advanced techniques for smart phone service and troubleshooting and (ii) Energy Harvesting, offered from the academic year 2019-2020 **(pp 477-479)**.

10) FROM THE BOARD OF STUDIES OF CHEMISTRY DEPARTMENT

Dr.A.Xavier, Chairman, Board of Studies in Chemistry, shall move and **Dr.P.S. Harikrishnan** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

10.1. Resolved to implement the syllabi for B.Sc. Chemistry 1st year, evaluation components and question paper pattern for those who join B.Sc. Chemistry from the academic year 2020-21 **(pp 480-487, 489-510)**.

10.2. Resolved to implement the syllabi for Ancillary Chemistry, evaluation components and Question paper pattern for those who join B.Sc. Mathematics, Physics, Botany and Zoology from the academic year 2020-21. The students of Botany and Zoology will study the ancillary Chemistry in their first year and the students of Mathematics and Physics will study the ancillary Chemistry in their second year **(pp 488, 511-522)**.

10.3. Resolved to implement the syllabi for Ancillary Chemistry, evaluation components and question paper pattern for those who join B.Sc. Maths, Physics, Microbiology and Biotechnology in SF stream from the academic year 2020-2021 onwards. The students of Biotechnology and Microbiology will study the Ancillary Chemistry in their first year and the students of Mathematics and Physics will study the Ancillary Chemistry in their second year **(pp 488, 511-522)**.

10.4. Resolved to implement a Certificate course in "purification and characterization of compounds" from the academic year 2020-21 **(P 523)**.

11) FROM THE BOARD OF STUDIES OF BOTANY DEPARTMENT

Prof.S.Chellapandian, Chairman, Board of Studies in Botany, shall move and **Dr.P.Kannan** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

11.1. Resolved to introduce course structure and the revised syllabi adopting Outcome based education model and question paper pattern for B.Sc. Botany Students who join the course from the academic year 2020-2021 onwards **(pp 524-551, 565)**.

11.2. Resolved to introduce the revised syllabi and question paper pattern for Ancillary Botany students who join B.Sc.(Zoology) from the academic year 2020-2021 onwards **(pp 526, 552-565)**.

12) FROM THE BOARD OF STUDIES OF ZOOLOGY DEPARTMENT

Dr.S.Dinakaran, Chairman, Board of Studies in Zoology, shall move and **Dr.L.D.Devasree** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

12.1. Resolved to implement the revised overall course structure for B.Sc. Zoology under CBCS with OBE pattern for the students who join the course from the academic year 2020-2021 onwards **(pp 566-572)**.

12.2. Resolved to introduce the revised syllabi with CBCS and OBE pattern, evaluation components and question paper pattern for I year students of B.Sc. Zoology who join from the academic year 2020-2021 onwards **(pp 574-595, 606-609)**.

12.3. Resolved to introduce the revised syllabi with CBCS and OBE pattern, evaluation components and question paper pattern in ancillary Zoology for I B.Sc. Chemistry students who join from the academic year 2020-2021 onwards **(pp 573, 596-605, 610-613)**.

13) FROM THE BOARD OF STUDIES OF COMPUTER SCIENCE DEPARTMENT
Er.J.Rajendran, Chairman, Board of Studies in Computer Science, shall move and **Prof.R.Umasankari** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

13.1. Resolved to implement the revised syllabus with CBCS and OBE model for First Year B.Sc. Computer Science students of both Aided and Self-finance stream for those who will join from the academic year 2020-21 onwards **(pp 614-643)**.

13.2. Resolved to introduce a certificate course "Desktop publishing (DTP- Adobe Photoshop & flash)" from the academic year 2020-21 onwards during even semester **(pp 644-645)**.

14) FROM THE BOARD OF STUDIES OF INFORMATION TECHNOLOGY DEPARTMENT
Dr.K.Rajasaravanakumar, Chairman, Board of Studies in Information Technology, shall move and **Dr.N.Paneerselvam** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

14.1. Resolved to implement the revised overall course structure for B.Sc., Information Technology in the Self-financing stream under CBCS with OBE pattern for the students who join the course from the academic year 2020-2021 onwards **(pp 646-653)**.

14.2. Resolved to implement the revised syllabi for B.Sc., Information Technology under CBCS with OBE pattern for the first and second semesters for the students who are joining from the academic year 2020-2021 onwards **(pp 654-683)**.

15) FROM THE BOARD OF STUDIES OF MICROBIOLOGY DEPATMENT
Dr.N.Paneerselvam, Chairman, Board of Studies in Microbiology, shall move and D**r.K.Rajasaravanakumar** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

15.1. Resolved to implement the revised overall course structure for B.Sc., Microbiology in the Self-financing stream under CBCS with OBE pattern for 3years for the students who are joining from the academic year 2020-2021 onwards **(pp 684-689)**.

15.2. Resolved to implement the revised syllabi for B.Sc., Microbiology under CBCS with OBE pattern for the first and second semesters for the students who are joining from the academic year 2020-2021 onwards **(pp 690-714)**.

15.3. Resolved to implement revised ancillary papers in Microbiology syllabi under CBCS with OBE pattern for II year B.Sc., Biotechnology students who are joining from the academic year 2020-2021 onwards **(pp 689, 715-727)**.

15.4. Resolved to introduce a certificate course on Mushroom Technology for B.Sc., Microbiology students under the Self-financing stream **(pp 689, 728-729)**.

16) FROM THE BOARD OF STUDIES OF BIOTECHNOLOGY DEPARTMENT
Dr.N.Paneerselvam, Chairman, Board of Studies in Biotechnology, shall move and **Dr.K.Rajasaravanakumar** shall second the following resolutions passed in the Board of studies meeting held on 18.03.2020.

16.1. Resolved to implement the revised overall course structure for B.Sc. Biotechnology in the self-financing stream under CBCS with OBE pattern for three years for the students who are joining from the academic year 2020-2021 onwards **(pp 730-733)**.

16.2. Resolved to implement the revised syllabi for B.Sc. Biotechnology under CBCS with OBE pattern for the first and second semesters for the students who are joining from the academic year 2020-2021 onwards **(pp 734-752)**.

16.3. Resolved to introduce a certificate course on Clinical Laboratory Technology for B.Sc. Biotechnology students under the Self-financing stream **(pp 733, 753-754)**.

17) FROM DEAN (ACDEMIC)
Prof.S.Sivaramakrishnan, Dean (Acdemic), shall move and **Dr.I. Sahul Hamid** shall second the following resolutions:

17.1. Resolved to approve the panel of experts to be nominated for Board of Studies in all degree programmes for the period of two years with effect from the academic year 2020-21.

17.2. Resolved to award "FIRST CLASS WITH DISTINCTION" as a class in all Undergraduate programmes to students who clear all papers in the first attempt and secure atleast 75% in their Part – III for the students who join from the academic year 2020-21 onwards.

18) FROM THE MEMBER – PRIVATE RESOLUTION

18.1. **Prof.S.Chellapandian** shall introduce and **Dr.S.Dinakaran** shall second the common syllabus for a paper titled, "Environmental science and Gender Awareness" for all UG programs under both the aided and self-financed streams as a mandatory requirement of TANSCHE for all UG students who join from the academic year 2020-21 onwards **(pp 761-766)**.

18.2 **Dr.S.Theenathayalan** shall move and **Dr.A.Mayilmurugan** shall second the common syllabus for a paper titled, "Value education and Professional ethics" as mandated by TANSCHE for all UG students who join from the academic year 2020-21 onwards **(pp 755-760)**.

IV. Any Other Subject

Dr. R. Eswaran	**Dr. J. Suresh**
Member Secretary	Principal & Chairman

x

Department of Physics

Revised Curriculum
(Choice Based Credit system with Outcome Based Education)
Academic Year 2020-2021 onwards

VISION

To develop the minds of the students by inculcating motivation for learning fundamentals at all levels UG, PG and research leading to academic excellence.

MISSION

- To provide high quality physics education to equip students globally for higher education and research.
- To motivate and train students to develop / innovate existing or emerging technologies for future needs.
- To develop qualities focusing on human values using rational thinking.
- To provide education with emphasis on moral and spiritual values.

PROGRAMME OUTCOMES FOR BSC. GRADUATES

At the end of the programme the graduates will be able to

PO1	Integrate learned skills and knowledge derived from the study of the science and other related disciplines, acquiring the necessary depth and breadth required for a transdisciplinary perspective.
PO2	Demonstrate proficiency in using disciplinary – appropriate methods for research, critical analysis or creative work and provide scientific solutions to the problems of the society.
PO3	Communicate conclusions, interpretations, and implications clearly, concisely and effectively, both orally and in writing for different types of audiences.
PO4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and ways of mitigating them.
PO5	Use modern tools, resources and software and be abreast with the emerging trends in their disciplinary area and practice life long learning.

Programme Educational Objectives (PEOs)

After successful completion of the programme the graduate will

- **PEO–1** Apply knowledge and skills acquired in the disciplinary domain for providing solutions to real life problems.
- **PEO–2** Choose a suitable career option or higher education and excel in Competitive examination.
- **PEO–3** Acquire interpersonal skills, be social, be responsible, excel in team work and become leaders in their domain.
- **PEO–4** Communicate effectively and set high moral and ethical standards.
- **PEO–5** Adapt to the constantly evolving technology and be life- long learners.

Programme specific learning outcomes (PSO) aligned with Graduate Attributes

At the end of the programme, the students will be able to

	Programme specific learning outcomes	Graduate Attributes
PSO–1	Demonstrate a fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Mechanics & Properties of Matter, Heat & Thermodynamics, Electricity & Magnetism, Optics & Spectroscopy, Nuclear & Particle Physics, Condensed matter Physics, Atomic & Molecular Physics, Mathematical Physics, Classical & Statistical Mechanics, Quantum Mechanics & relativity, Electronics and its linkages with related disciplinary areas / subjects like Chemistry, Mathematics, Life sciences, Environmental sciences, Atmospheric Physics, Computer science, Information Technology.	Knowledge in core competency
PSO–2	Tackle problems and offer out of the box solutions based on analysis and critical thinking deeply rooted in concepts of Physics.	Problem analysis
PSO–3	Problem–solving skills that are required to solve different types of Physics–related problems with well–defined solutions, and tackle open–ended problems that belong to the disciplinary–area boundaries.	Design and development of solution for complex problems
PSO–4	Demonstrate the ability to use skills in Physics and its related areas of technology for formulating and tackling Physics–related problems and identifying and applying appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.	Modern tool usage
PSO–5	Recognize the importance of mathematical modeling simulation and computing, and the role of approximation and mathematical approaches to describing the physical world.	Modern tool usage
PSO–6	Plan and execute Physics–related experiments or investigations, analyze and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and purpose–written packages, and report accurately the findings of the experiment/investigations while relating the conclusions/findings to relevant theories of Physics.	Individual and team work, project management, communication
PSO–7	Relate and apply concepts of Physics to real life situations.	Life long learning

Courses of Study with Credit Distribution for students undertaking B.Sc., Degree in Physics.

Part	Category	Courses	Credits
I	Tamil/Sanskrit/Hindi	4	12
II	English	4	12
III	Allied (Theory)	4	16
	Allied (Practical)	2	4
	Core (Theory)	12	52
	Core (practical)	4	12
	Elective	4	13
	Skill Based Elective	4	8
IV	Non Major Elective	2	4
Commonto all	Value Education & Professional Ethics	1	3
	Environment & Gender Studies	1	3
V	Extension Activity	1	1
	Total	**43**	**140**

The curriculum is strengthened through the recent revisions as per UGC and TANSCHE Norms.

Based on curriculum based feedback from students and parents the following courses have been included.

1. PYTHON
2. SCILAB
3. Astrophysics

Evaluation Pattern

THEORY

	25 marks	
	Components	**Marks**
Internal (Formative)	Test	10
	Assignment	5
	Attendance	5
	Any assessment tool(s) at the discretion of the course teacher(Accountable and verifiable)	5
External (Summative)	**75 marks** (A maximum of upto 10% (7.5 marks) of the questions may be asked from self – study part of the syllabus)	
Total	**100 marks**	

PRACTICALS

	40 marks	
	Components	**Marks**
Internal (Formative)	Test	20
	Observation	10
	Record	10
External (Summative)	**60 marks**	
Total	**100 marks**	

Formative - Blue – Print – Model

S. No	CLOs	K-level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short answers No. of Questions	Section B Short answers K-Level	Section C (Either/or Choice)	Section D (Open Choice)	Total
1.	CLO A	Upto K3	2	K1 & K2	1	K1	2(K2&K2)	2(K2&K3)	
2	CLO B	UptoK3/K4	2	K1 & K2	2	K2	2(K3&K3)	1(K3/K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each Question			1		2		5	10	
Total marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	20/10	**30/20**	50/33	**50/33**
K4	-	-	-	0/10	**0/10**	0/17	**0/17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

I B.Sc., PHYSICS
First Semester

Category	Courses	Contact hours/week	Credits
Part –I	Tamil–I / Sanskrit– I / Hindi–I	6	3
Part – II	English –I	6	3
Part III	Allied Mathematics–I	6	5
Major Core –1	Properties of matter & Sound	3	3
Major Core– 2	Mechanics	3	3
Major Core Practical	Major Practical – I	3	—
Common to all	Value Education & Professional Ethics	3	3
	Total	**30**	**20**

Semester wise Mapping of Courses with Programming Specific Outcomes (PSOs)

Programme Specific Outcomes	Allied Mathematics -I	Major core–1 (Properties of matter & Sound)	Major core–2 (Mechanics)	Major practical–I
PSO 1	3	3	3	1
PSO 2	-	2	3	1
PSO 3	-	3	3	–
PSO 4	-	2	2	3
PSO 5	-	–	-	–
PSO 6	-	2	-	3
PSO 7	-	3	3	2

Advance application– 3;   Intermediate level–2; Basic level–1

I B.Sc., PHYSICS
Second Semester

Category	Courses	Contact hours/ week	Credits
Part –I	Tamil–II/Sanskrit–I/Hindi–I	6	3
Part – II	English –II	6	3
Part III: Allied –II	Allied Mathematics–II	6	5
Major Core – 3	Heat & Thermodynamics	3	3
Major Core – 4	Optics	3	3
Major Core Practical	Major Practical – I	3	3
Common to all	Environment & Gender studies	3	3
	Extension	—	1
	Total	**30**	**24**

Semester wise Mapping of Courses with Programming Specific Outcomes (PSOs)

Programme Specific Outcomes	Allied Mathematics-II	Allied practical	Major core –3 (Heat & Thermodynamics)	Major core – 4 (Optics)	Major practical–I
PSO 1	3	1	3	3	1
PSO 2	-	1	3	3	1
PSO 3	-	-	3	3	–
PSO 4	-	3	2	2	3
PSO 5	-	-	-	-	–
PSO 6	-	2	-	-	3
PSO 7	-	2	3	3	2

Advance application– 3;   Intermediate level–2; Basic level–1

The Madura College (Autonomous), Madurai–625011
Department of Physics
Curriculum structure for BSc Physics (Major) to be implemented from 2020–2021

Semester	Course	Subject Code	Course title	Contact hours/week	Credits
I	Part –I : Lang–I	20U1TLA1	Tamil–I/Sanskrit–I/Hindi–I	6	3
	Part – II : English –I	20U1NEN1	English –I	6	3
	VE &PE	20U1VEN1	Value Education & Professional Ethics	3	3
	Part III: Allied –I	20U1MAC1	Allied Mathematics–I	6	5
	Major Core –1	20U1PMC1	Properties of matter & Sound	3	3
	Major Core– 2	20U1PMC2	Mechanics	3	3
	Major Core Practical	20U2PMP1	Major Practical – I	3	—
	Total			**30**	**20**
II	Part – I : Lang–II	20U2TLA2	Tamil–II/Sanskrit–II/Hindi–II	6	3
	Part – II : English–II	20U2NEN2	English–II	6	3
	E & G S	20U2EVS1	Environment & Gender studies	3	3
	Part III :Allied–II	20U2MAC2	Allied Mathematics–II	6	5
	Major Core –3	20U2PMC3	Heat & Thermodynamics	3	3
	Major Core– 4	20U2PMC4	Optics	3	3
	Major Core Practical	20U2PMP1	Major Practical–I	3	3
	Extension (AEEP)			—	1
	Total			**30**	**24**
III	Part –I : Lang–III	20U3TLA3	Tamil–III/Sanskrit–III/Hindi–III	6	3
	Part – II : English–III	20U3NEN3	English–III	6	3
	Non Major Elective (NME– I)	20U3PNM1	Communication system	2	2
	Skill based Elective (SBE–I)	20U3PSM1	Mathematical methods	2	2
	Part III:Allied–I	20U3CAC1	Allied Chemistry–I	4	4
	Allied Practical	20U4CAP1	Allied Chemistry Practical	2	—
	Major Core –5	20U3PMC5	Electricity & Magnetism	5	5
	Major Core Practical	20U4PMP2	Major Practical – II	3	—
	Total			**30**	**19**
IV	Part– I : Lang –IV	20U4TLA4	Tamil–IV/Sanskrit–IV/Hindi–IV	6	3
	Part – II : English–IV	20U4NEN4	English–IV	6	3
	Non Major Elective (NME–II)	20U4PNM2	Discovering Physics	2	2
	Skill based Elective (SBE–II)	20U4PSM2	Digital Instrumentation Skill	2	2
	Part III:Allied –II	20U4CAC2	Allied Chemistry–II	4	4
	Allied Practical	20U4CAP1	Allied Chemistry Practical	2	2
	Major Core –6	20U4PMC6	Quantum Mechanics & Spectroscopy	5	5
	Major Core Practical	20U4PMP2	Major Practical – II	3	3
	Total			**30**	**24**

	Skill based Elective (SBE–III)	20U5PSM3	PYTHON	2	2
	Major Core –7	20U5PMC7	Analog Electronics	5	5
	Major Core– 8	20U5PMC8	Classical &Statistical Mechanics	5	5
V	Major Core –9	20U5PMC9	Atomic Physics & Relativity	5	5
	Major Core Practical	20U6PMP3	Major Practical – III	3	–
	Major Core Practical	20U6PMP4	Major Practical –IV	3	–
	Major Elective –I	20U5PME1	Elective –I	4	4
	Major Elective –II	20U5PME2	Elective –II	3	3
			Total	**30**	**24**
	Skill based Elective (SBE–IV)	20U6PSM4	SCILAB	2	2
	Major Core –10	20U6PMC10	Nuclear Physics	5	5
	Major Core– 11	20U6PMC11	Solid State Physics	5	5
VI	Major Core –12	20U6PMC12	Digital & Communication Electronics	5	5
	Major Core Practical	20U6PMP3	Major Practicals – III	3	3
	Major Core Practical	20U6PMP4	Major Practicals– IV	3	3
	Major Elective –III	20U6PME3	Elective –III	4	3
	Major Elective –IV	20U6PME4	Elective –IV	3	3
			Total	**30**	**29**

ELECTIVES OFFERED

1. Biomedical instrumentation
2. Geomagnetic Physics
3. Soil Physics
4. Weather Forecasting
5. Crystallography, Thin film, Spectroscopy& Computational Physics
6. Nobel prize winning innovations
7. Energy Physics
8. Non conventional energy sources
9. Astrophysics

Curriculum structure for B.Sc. Mathematics with ancillary Physics to be implemented from 2020–2021

Semester	Course	Subject Code	Course title	Contact hours/week	Credits
I	Part III: Allied –I	20U1PAC1	Allied Physics –I	4	4
	Allied Practical	20U2PAP1	Allied Practical	2	—
II	Part III:Allied–II	20U2PAC2	Allied Physics –II	4	4
	Allied Practical	20U2PAP1	Allied Practical	2	2
			Total	**12**	**10**

Curriculum structure for B.Sc. Chemistry with ancillary Physics to be implemented from 2020–2021

Semester	Course	Subject Code	Course title	Contact hours/week	Credits
III	Part III:Allied–I	20U3PAC1	Allied Physics –I	4	4
	Allied Practical	20U4PAP1	Allied Practical	2	—
IV	Part III:Allied –II	20U4PAC2	Allied Physics –II	4	4
	Allied Practical	20U4PAP1	Allied Practical	2	2
			Total	**12**	**10**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Physics				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
I	Major Core–1	20U1PMC1	PROPERTIES OF MATTER AND SOUND	3	3	25	75	100

Course Objectives:

1. To expose the students to the knowledge of materials suitable for construction of buildings based on their moduli of elasticity.
2. To impart knowledge on properties of liquids and their determination.
3. To understand the physics of sound through different experimental techniques.

Unit-I: Elasticity

Elasticity – Hooke's law − Elastic moduli – Poisson's ratio – Relation between the three moduli – Bending of beams – Expression for bending moment – Cantilever – Uniform bending theory – Non -uniform bending theory – Torsion of a body – Expression for couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body – Rigidity modulus by dynamic torsion method. **Self study:** Determination of Young's modulus by pin and microscope method – scale and telescope method.
Audit: Rigidity modulus by Static torsion method.

Unit-II: Viscosity

Viscosity – Coefficient of viscosity – Streamlined and Turbulent motion – Critical velocity – Rate of flow of liquid in a capillary tube – Poiseuille's formula – Theory – Experiment (variable pressure head) –Viscosity of highly viscous liquid – Terminal velocity – Stoke's method (dimensional method only) – Ostwald Viscometer.
Self study: Viscosity of gas – Meyer's formula.
Audit: Rankine's method

Unit-III: Surface Tension

Surface tension – Definitions – Units and dimensions – Explanation of surface tension on kinetic theory – Surface energy – Excess pressure inside a liquid drop and soap bubble – Excess pressure inside a curved liquid surface – Surface tension and interfacial tension by drop weight method – Theory and experiment – Angle of contact – Variation of surface tension with temperature –Determination of surface tension by Jaeger's method.
Self study: Work done in increasing the area of a surface – Work done in blowing a bubble.
Audit: Quincke's method

Unit-IV: Sound

Simple Harmonic Motion – Composition of two S.H.M at right angles– Lissajous's figures– Experimental methods for obtaining Lissajous's figures – Free, Damped and Forced vibrations.
Laws of transverse vibration of strings – Sonometer – Determination of frequency using Melde's apparatus – Intensity levels – Decibel – Noise pollution.
Self study: Uses of Lissajous's figures
Audit: Composition of two S.H.M in a straight line.

Unit-V:Ultrasonics and Acoustics **(9 hrs)**

Ultrasonics – Production – Piezoelectric crystal method – Magnetostriction method –Detection – Properties and Applications – Acoustics of building – Reverberation – Sabine's Reverberation formula (No derivation) – Factors affecting acoustics of building.

Self study: Determination of velocity of ultrasonic waves in a liquid.

Audit: Sound distribution in an auditorium.

Books for Study

1. R.Murugeshan , Properties of Matter, Reprint 2017, S.Chand& Co.,

   Unit I: 1.1, 1.2, 1.7, 1.9, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17(1), 1.19, 1.20, 1.21

   Unit II: 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 2.9, 2.13

   Unit III: 3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.9, 3.11, 3.12, 3.17, 3.18.

   Unit V: 11.9, 11.10, 11.11, 11.12, 11.13, 11.14,11.15, 11.16, 11.17, 11.18, 11.21, 11.22.

2. N.Subrahmanyam and Brijlal, A text Book of Sound, Second revised edition, 1995, Vikas Publishing House Ltd.

   Unit IV: 1.3, 1.4, 1.5, 2.1, 2.4, 2.8, 2.9, 3.1, 3.2, 3.3, 3.4, 7.3, 7.4, 7.5.

3. R.Murugeshan and Er.KiruthigaSivaprasath, Properties of Matter and Acoustics, 2019, S.Chand& Co.,

   Unit IV: 4.9, 4.10, 4.11, 4.12, 4.13.

Books for References

1. D.S.Mathur , Elements of Properties of Matter, 2004, S.Chand& Co.,
2. Brij Lal and N.Subrahmanyam , Properties of Matter, Reprint 2004, S.Chand& Co.,
3. H.R.Gulati, Fundamentals of general Properties of Matter, 1982, S.Chand& Co.,
4. D.Halliday, Resnick and J Walker, Fundamentals of Physics, 6th edition, 2001, Wiley Eastern Ltd.

Web Resources

1. Applications of elastic behavior of materials
   (Link: https://www.toppr.com/guides/physics/mechanical–properties–of– solids / applications –of–elastic–behaviour–of–materials/)
2. Importance of viscosity in real life
   (Link: https://www.careerdune.com/2017/10/importance–of–viscosity–in–real–life.html
   http://www.scienceclarified.com/everyday/Real–Life–Chemistry–Vol–3–Physics–Vol–1/Aerodynamics.html
   https://www.britannica.com/science/aerodynamics)
3. Importance of surface tension and its application
   (Link: https://blog.biolinscientific.com/why–is–surface–tension–important)
4. Physics in Musical instruments
   (Link:http://www.physics.usyd.edu.au/teach_res/hsp/sp/mod31/m31_strings.htm)
5. Acoustic properties of building materials
   (Link:https://theconstructor.org/building/acoustic–properties–building–materials/14449/)

Course Designers:

1. Mrs. G.Gowri
2. Mr. T.Vivekanandan
3. Mrs. M.Megala

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Elasticity, Hooke's law, Elastic moduli	1	Chalk and talk, Quiz and assignment
	Poisson's ratio, Relation between the three moduli	1	
	Bending of beams, Expression for bending moment, Cantilever, Uniform bending theory, Non -uniform bending theory	3	
	Torsion of a body, Expression for couple per unit twist, Work done in twisting a wire	2	
	Torsional oscillations of a body, Rigidity modulus by dynamic torsion method	2	
Unit II	Viscosity, Coefficient of viscosity, Streamlined and Turbulent motion	2	PPT, Chalk and talk, and Group discussion
	Critical velocity, Rate of flow of liquid in a capillary tube	1	
	Poiseuille's formula, Theory, Experiment - variable pressure head	2	
	Viscosity of highly viscous liquid, Terminal velocity	2	
	Stoke's method - dimensional method, Ostwald Viscometer	2	
Unit III	Surface tension, Definitions, Units and dimensions, Explanation of surface tension on kinetic theory	2	PPT, Chalk and talk, Quiz and Group discussion
	Surface energy, Excess pressure inside a liquid drop and soap bubble, Excess pressure inside a curved liquid surface	2	
	Surface tension and interfacial tension by drop weight method, Theory and experiment	2	
	Angle of contact, Variation of surface tension with temperature	2	
	Determination of surface tension by Jaeger's method.	1	
Unit IV	Simple Harmonic Motion , Composition of two S.H.M at right angles	1	PPT, Chalk and talk, Assignment
	Lissajous's figures, Experimental methods for obtaining Lissajous's figures	2	
	Free, Damped and Forced vibrations	1	
	Laws of transverse vibration of strings, Sonometer, Determination of frequency using Melde's apparatus	3	
	Decibel, Noise pollution	2	
Unit V	Ultrasonics, Production, Piezoelectric crystal method	2	Chalk and talk, Quiz and Interaction
	Magnetostriction method, Detection, Properties and Applications.	3	
	Acoustics of building, Reverberation, Sabine's Reverberation formula	3	
	Factors affecting acoustics of building	1	

Pedagogy

Chalk and Talk, PPT, Quiz, Group discussion, Seminar, Interaction, Problem solving.

Course learning Outcomes

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

CLOs	Course Learning Outcomes	Knowledge Level
CLO–1	Apply the principles of elasticity in construction and allied fields and able to examine the effects in them	UptoK4
CLO–2	Apply the principles of fluid dynamics in aerodynamics	UptoK3
CLO–3	Infer the importance of surface tension in real life applications	UptoK2
CLO–4	Make use of the physics of sound for musical instruments	UptoK3
CLO–5	Utilize the physical parameters related to sound in the design and construction of buildings with good acoustic properties	UptoK3

Mapping with CLOs with PSOs

#	PSO–1	PSO–2	PSO–3	PSO–4	PSO–5	PSO–6	PSO–7
CLO–1	3	2	2	3			1
CLO–2	3	3	2	2			1
CLO–3	3	2	2				1
CLO–4	3	3	2	3			1
CLO–5	3	3	2	3			1

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	1	2		
CLO2	3	2	3	1	
CLO3	3	2	2	1	
CLO4	3	1	1		2
CLO5	3	2	2	1	

Advance application– 3;   Intermediate level–2; Basic level–1

Summative - Blue – Print - Model
(Mapping with Course Learning Outcomes(CLOs)

Units	CLOs	K-Level	Section A MCQs		Section B Short answers		Section C (Either or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
4	CLO 4	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			**10**		**10**		**25**	**30**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Physics				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
I	Major Core–2	20U1PMC2	MECHANICS	3	3	25	75	100

Course Objectives:

The students will be able to

1. Understand the fundamental ideas on conservation laws and its applications
2. Learn the basic ideas of rotational and vibrational motion of rigid bodies.
3. Expose the concepts of Gravitational fields and some idea about fluid mechanics.

Unit-I: Laws of Motion

Laws of conservation of energy – Work energy theorem – Potential energy – Conservative and non conservative forces – Linear momentum and its conservation – Collision – Elastic and inelastic collision – Newton's law of impact – Coefficient of restitution – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Calculation of final velocities of the spheres – Loss of K.E due to direct impact of two smooth spheres.

Self Study: work done by spring force, potential energy curve, Loss of K.E due to Oblique impactof two smooth spheres.

Audit: work done by gravitational force, Oblique impact of a smooth sphere on a fixed plane.

Unit-II: Dynamics of Rigid body

Moment of inertia – Theorems of perpendicular and parallel axes – M.I of a circular ring, disc, solid sphere – Compound pendulum – theory – equivalent simple pendulum – reversibility of points of oscillation and suspension.

Self study: Moment of Inertia of a hollow sphere, Determination of g and k using compound pendulum.

Audit: Moment of Inertia of a hollow cylinder.

Unit-III: Gravitation

Newton's law of gravitation – Kepler's laws of motion – G by Boy's method – Acceleration due to gravity. Gravitational field – Gravitational potential – Gravitational potential and field due to spherical shell – Gravitational potential and field due to a solid sphere (inside and outside).

Self study: Variation of g with altitude, depth and rotation of earth. Value of g at poles and equator.

Audit: Mass and density of earth

Unit-IV: Central Force Motion

Angular velocity, Kinetic energy of a rotating body – Angular momentum and its conservation – Torque and angular acceleration – Relation between torque and angular momentum – Expression for acceleration of a body rolling down an inclined plane without slipping – Center of mass – Motion of velocity and acceleration of centre of mass – System of variable mass – Rocket motion

Self study: acceleration of centre of mass , determination of motion of individual particle.

Audit: Satellite.

Unit-V: Statics and Hydrodynamics

Friction – Laws of friction – Angle of friction – Cone of friction – Hydrodynamics – Equation of continuity – Energy of a liquid – Euler's equation for unidirectional flow – Bernoulli's theorem – statement and proof – Applications – Venturimeter – Wings of an aeroplane –Torricelli's theorem.

Self study: Pitot's tube.

Audit: Centre of pressure, vertical rectangular lamina

Books for Study

1. D.S.Mathur and P.S. Hemne , Mechanics , 2012, S.Chand& Co.,
   Unit I: 5.1, 5.2, 5.3, 5.4, 5.10, 6.1.
    Unit IV: 6.2, 6.3, 6.12
2. Brijlal& N. Subramaniam , Properties of matter , 2001 , S.Chand&Co.Ltd
   Unit II: 3.1, 3.2, 3.9(a), 3.10, 3.16, 3.17, 3.20, 5.11 – 5.14.
   Unit III: 5.2, 5.4, 5.6, 5.9, 5.22, 5.23, 5.25, 5.26.
   Unit IV: 3.3 , 3.4 , 3.5 , 3.6 , 3.28.
3. R.Murugeshan , Properties of Matter, 2017 , S. Chand & Co.
   Unit I – 8.1 , 8.2 , 8.4 , 8.5 , 8.6 .
   Unit IV – 10.5, 10.9.
   Unit V – 22.1, 22.2, 22.3, 4.1, 4.2, 4.3, 4.4.
4. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman, 14th edition , 2017 Pearson India Education Services Pvt.Ltd.

Applications : Unit I: Examples 6.1 , 6.2 , 6.3 , 6.5 , 6.9 , 6.10 , 8.2 , 8.3 , 8.4 , 8.6 , 8.9 , 8.10

(Page**s** 197–206, 213–215, 262 – 278)

Unit II: Examples 9.7 , 9.9 (Pages 307–313)

Unit III : Examples 13.1 , 13.2 , 13.3 , 13.4 , 13.6 , 13.8. (Pages 422 – 437).

Unit IV: Examples 8.13 ,8.15 , 8.16 ,10.4 , 10.8 , 10.9 , 10.10 , (Pages 278 – 284 , 333 – 345 ,).

Unit V: Examples12.6, ,12.7 , 12.8 (Pages 166–171 , 403 –409)

Books for References

1. Narayanamoorthy, Mechanics , Part I and II , National Publishing Company.
2. P. Duraipandian, LaxmiDuraipandian, MuthamizhJayapragasam, Mechanics, reprint 2018, S.Chand& Co. Ltd.
3. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
4. Paul G. Hewitt *CONCEPTUAL PHYSICS*, tenth edition, 2015 , Pearson Education, Inc. and Dorling Kindersley Publishing Inc.

Web Resources

Work energy theorem:

1. https://www.texasgateway.org/resource/work–energy–theorem
2. https://realizeengineering.files.wordpress.com/2013/10/5eplannod8_work–energy.pdf
3. https://ocw.mit.edu/courses/mechanical–engineering/2–003sc–engineering–dynamics–fall–2011.
4. https://realizeengineering.files.wordpress.com/2013/10/5eplannod3_workenergy.pdf

Elastic and inelastic collision:

5. https://en.wikipedia.org/wiki/Elastic_collision.

6. http://vlab.amrita.edu/?sub=1&brch=74&sim=189&cnt=1
7. http://vlab.amrita.edu/?sub=1&brch=74&sim=197&cnt=1
8. https://sciencing.com/mechanics

Central force:

9. https://byjus.com/physics/central–force/

Momentum:

10. https://realizeengineering.files.wordpress.com/2014/03/5eplannod9_impulsemomentum_methods.pdf
11. https://www.britannica.com/science/mechanics/Rigid–bodies
12. https://www.real–world–physics–problems.com/physics–of–bowling.html

Torque and acceleration:

13. http://vlab.amrita.edu/?sub=1&brch=74&sim=1517&cnt=1

Bernoulli's theorem:

14. http://www.scienceclarified.com/everyday/Real–Life–Chemistry–Vol–3–Physics–Vol–1/Fluid–Mechanics–Real–life–applications.html5
15. https://realizeengineering.files.wordpress.com/2013/10/5eplannof4dynamics-of-fluid-motion1.pdf

Course Designers:

1. Mr. V.Meenakshi Sundaram
2. Dr. M.Revathi
3. Mr. S.Ramakrishnan

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Laws of conservation of energy, work energy theorem, potential energy , conservative and non conservative forces	**2**	PPT, Chalk and talk, Quiz and assignment
	Linear momentum and its conservation, Collision, Elastic and inelastic collision, Newton's law of impact, coefficient of restitution	**2**	
	Direct impact between two smooth spheres , Calculation of final velocities of the spheres and problems	**2**	
	Oblique impact between two smooth spheres Calculation of final velocities of the spheres and problems	**1**	
	Loss of K.E due to direct impact of two smooth spheres and problems discussion	**2**	
Unit II	Rigid body ,Moment of inertia	**1**	Chalk and talk, Quiz and assignment
	Theorems of perpendicular and parallel axes	**2**	
	M.I of a circular ring, disc, solid sphere and problems	**2**	
	Compound pendulum , theory	**2**	
	Equivalent simple pendulum – reversibility of points of oscillation and suspension.	**2**	
Unit III	Newton's law of gravitation, Kepler's laws of motion and problems	**3**	Chalk and talk, Quiz, assignment and seminar
	G by Boy's method	**1**	
	Acceleration due to gravity, Gravitational field, Gravitational potential	**1**	
	Gravitational potential and field due to spherical shell(inside and outside).	**2**	
	Gravitational potential and field due to a solid sphere (inside and outside).	**2**	
Unit IV	Angular velocity, Kinetic energy of a rotating body, angular momentum and its conservation	**2**	Chalk and talk, quiz, Group discussion
	Torque and angular acceleration , Relation between torque and angular momentum	**2**	
	Expression for acceleration of a body rolling down an inclined plane without slipping and problems	**1**	
	Center of mass , motion of velocity and acceleration of centre of mass	**2**	
	system of variable mass , Rocket motion	**2**	
Unit V	Friction,laws of friction, angle of friction and cone of friction and problems	**2**	PPT, Chalk and talk, Quiz and Interaction
	Hydrodynamics , Equation of continuity , Energy of a liquid	**1**	
	Euler's equation for unidirectional flow , Bernoulli's theorem , statement and proof	**3**	
	applications ,Venturimeter	**1**	
	wings of an aeroplane,Torricelli's theorem and problem discussion	**2**	

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , interaction and field visit.

Course Learning Outcomes

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

CLOs	Course Learning Outcomes	Knowledge Level
CLO 1	Use work energy theorem to physical systems.	UptoK3
CLO 2	Apply rigid body dynamics to propeller design and in biological systems.	UptoK3
CLO 3	Analyze gravitation and its effects on heavenly bodies based on the laws of Newton and Kepler.	UptoK4
CLO 4	Apply principles of conservation of momentum to real life problems involving collision, rocket propulsion, etc	UptoK3
CLO 5	Use principles of hydrodynamics to real life situations	UptoK3

Mapping of CLOs with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3	3	2	2			3
CLO2	3	2	3	3	1		3
CLO3	3	2	3	2	1		3
CLO4	3	2	2	2			3
CLO5	3	3	2	2	1		2

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	2	3	
CLO2	3	2	2	3	2
CLO3	3	1	1	3	
CLO4	3	3	1	3	2
CLO5	3	2	2	3	

Advance application −3;Intermediate level −2; Basic level−1

Summative - Blue – Print - Model
(Mapping with Course Learning Outcomes (COs))

Units	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short answers No. of Questions	Section B Short answers K-Level	Section C (Either or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 &K2	1	K2	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	**42%**
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Physics				
Sem	Course	Subject Code	Course title	Credits	Contact hours/week	CIA	Ext	Total
II	Major Core – 3	20U2PMC3	HEAT AND THERMODYNAMICS	3	3	25	75	100

Course Objectives:

1. To understand the phenomena connected with measurement of temperature.
2. To know the concept of specific heat capacities of matter, transmission of heat, concept of lowering the temperature, liquefying gases and process of making heat to do mechanical work.
3. To understand the application of thermodynamics in real life situations.

Unit-I: Thermometry and Calorimetry

Concept of heat and temperature — Calendar and Griffith's bridge - Specific heat capacity of solids – Regnault's method of mixtures(solid) – Newton's law of cooling – Specific heat capacity of liquids – Determination of specific heat capacity of liquid– Calendar and Barnes method – Specific heat capacity of gases — C_v by Joly's differential steam calorimeter method – C_p by Regnault's method.

Self study: C_p and C_v, Meyer's relation.

Audit : International temperature scale – Thermistor

Unit-II: Transmission of Heat

Conduction – Coefficient of thermal conductivity – Rectilinear flow of heat along a bar – Lee's disc method - Convection – Radiation – black body – Kirchhoff's law – Stefan – Boltzmann law – Energy distribution in black body spectrum – Wien's law – Rayleigh Jean's law – Planck's law – Solar constant – Temperature of the sun — Angstrom's pyroheliometer - Water flow pyroheliometer. **Self study:** Mechanism of heat transfer, Application of convection.

Audit : Lapse rate – Stability of the atmosphere

Unit-III: Kinetic Theory of Gases

Concept of Ideal or Perfect gas – Kinetic model – Brownian motion – Degree of freedom, Maxwell's law of equipartition of energy – Molecular collisions – Mean free path – Expression for mean free path – Transport phenomena – Expression for viscosity – Diffusion and thermal conductivity of gas – Van der Waals equation of state – Estimation of critical constants – Joule Thomson effect – porous plug experiment - Theory – Principle of Regenerative cooling – Production of low temperatures – Adiabatic demagnetization .

Self study: Properties of matter near critical point, Different methods of liquefaction of gases, Practical Applications of low temperature and refrigerators.

Audit: Super fluidity – Application of super fluidity

Unit-IV: Thermodynamics

Zeroth law of thermodynamics – Concept of heat – thermodynamic equilibrium – Work, Internal energy - first law of thermodynamics – Applications of first law of thermodynamics – Adiabatic equation of perfect gas – Isothermal process – Work done during isothermal & adiabatic process – Reversible and irreversible processes – Heat engine – Definition of efficiency – Carnot's ideal heat engine – Carnot's cycle – Effective way to increase efficiency – Carnot's engine – Second law of thermodynamics – Carnot's theorem.

Self study: Isothermal process, adiabatic process, Refrigerator
Audit: Steam engine, Internal combustion engine.

Unit-V: Entropy

Entropy – Change of entropy – Change of entropy in adiabatic process, Change of entropy in reversible and irreversible processes – Temperature – entropy diagrams – Physical significance of entropy – Entropy of a perfect gas – third law of thermodynamics   – Zero point energy – Negative temperature – Maxwell thermo dynamical relations – Derivation and application – Clausius – Clapeyron equation.

Self study: Change of entropy when ice converted into steam - Heat death of universe

Audit: First order phase transistions,Second order phase transition – Ehrenfest's equations

Books for Study

1. Heat, Thermodynamics and Statistical Physics– Brijlal, Dr.N.Subrahmanyam and P.S.Hemne, S.Chand& Co, New Delhi, Reprint 2016.

   Unit I: 13.1, 13.16, 14.1, 14.2, 14.5, 14.7, 14.11, 14.12.

   Unit II: 15.1, 15.2, 15.10, 15.11, 15.22, 8.6, 8.9, 8.10, 8.12, 8.13, 8.14, 8.15, 8.17, 8.26, 8.27, 8.28, 8.29.

   Unit III: 1.2,1.3,1.13,1.18,1.19, 3.1, 3.2, 3.5, 3.7, 3.8, 3.9,   3.11,   3.16, 2.4,2.8,2.10,2.13,2.20, 2.21,2.23,2.26,7.7,7.15,7.16

   Unit IV: 4.2,4.3, 4..4, 4.5, 4.6, 4.7, 4.10.1,4.10.4, 4.10.6,4.10.7,4.12,4.13,4.20,4.21,4.22,4.23, 4.24,4.25,4.26, 4.27, 4.28, 4.29, 4.30,4.32

   Unit V: 5.1, 5.2, 5.3,5.4, 5.6, 5.7, 5.8,5.9,5.15,5.16,5.17, 6.3, 6.4.7.

Books for References

1. Heat & Thermodynamics – J.B. Rajan, SC Publisher, New Delhi, 1985.
2. Concepts of Physics Volume I and II – H.C. Varma, BharatiBhawan Publishers, New Delhi, 2015
3. M. Narayanamoorthy and N. Nagarathinam, Heat, National publishing Co,Chennai, Eight edition, 1987.
4. Sears and Zemensky 's "University Physics with Modern Physics", 14th edition by Hugh D. Young , Roger A.Freedman.Copyright 2017 Pearson India Education Services Pvt.Ltd
5. Lecture notes on thermodynamics–Joseph M. Powers, Department of Aerospace and MechanicalEngineering–University of Notre Dame, Notre Dame, Indiana 46556–5637–USA updated 20 March 2019
6. Heat and Thermodynamics – D.S. Mathur, Sultan Chand & Sons, 5th Edition, New Delhi, 2014.
7. Thermal Physics – R. Murughesan and KiruthigaSivaprasath, S.Chand& Co, II Edition, New Delhi, 2008

Web Resources

Fundamentals of thermodynamics:

1. https://www.khanacademy.org/science/physics/thermodynamics
2. https://www.britannica.com/science/thermodynamics
3. https://www3.nd.edu/~powers/ame.20231/notes.pdf

Course Designers:

1. Dr.K.Neyvasagam
2. Mr.S.SivaramKrishnan
3. Mrs.S.Angayarkanni

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Concept of heat and temperature	**1**	Chalk and talk, Quiz and assignment
	Calendar and Griffith's bridge	**1**	
	Specific heat capacity of solids – Regnault's method of mixtures(solid)	**2**	
	Newton's law of cooling – Specific heat capacity of liquids	**2**	
	Determination of specific heat capacity of liquid– Callendar and Barnes method.	**1**	
	Specific heat capacity of gases – C_v by Joly's differential steam calorimeter method – C_p by Regnault's method	**2**	
Unit II	Conduction – Coefficient of thermal conductivity	**1**	PPT, Chalk and talk, and Group discussion
	Rectilinear flow of heat along a bar	**1**	
	Lee's disc method - Convection – Radiation – black body – Kirchhoff's law	**2**	
	Stefan – Boltzmann law – Energy distribution in black body spectrum – Wien's law – Rayleigh Jean's law – Planck's law – Solar constant	**3**	
	Temperature of the sun — Angstrom'spyroheliometer - Water flow pyroheliometer	**2**	
Unit III	Conduction – Coefficient of thermal conductivity – Rectilinear flow of heat along a bar	**1**	PPT, Chalk and talk, Quiz and Group discussion
	Concept of Ideal or Perfect gas – Kinetic model - Brownian motion – Degree of freedom	**1**	
	Maxwell's law of equipartition of energy – Molecular collisions – Mean free path – Expression for mean free path	**2**	
	Transport phenomena – Expression for viscosity – Diffusion and thermal conductivity of gas	**2**	
	Van der Waals equation of state – Estimation of critical constants – Joule Thomson effect – porous plug experiment - Theory – Principle of Regenerative cooling	**2**	
	Production of low temperatures – Adiabatic demagnetization	**1**	
Unit IV	Zeroth law of thermodynamics – Concept of heat – thermodynamic equilibrium	**2**	PPT, Chalk and talk, Assignment
	Work, Internal energy - first law of thermodynamics – Applications of first law of thermodynamics – Adiabatic equation of perfect gas	**2**	
	Isothermal process – Work done during isothermal & adiabatic process – Reversible and irreversible processes – Heat engine – Definition of efficiency – Carnot's ideal heat engine – Carnot's cycle	**3**	
	Effective way to increase efficiency – Carnot's engine – Second law of thermodynamics – Carnot's theorem	**2**	
Unit V	Entropy – Change of entropy – Change of entropy in adiabatic process	**2**	Chalk and talk, Quiz and Interaction
	Change of entropy in reversible and irreversible processes – Temperature – entropy diagrams – Physical significance of entropy	**2**	
	Entropy of a perfect gas — third law of thermodynamics – zero point energy – Negative temperature – Maxwell thermo dynamical relations –	**3**	
	Derivation and application – Clausius – Clapeyron equation.	**2**	

Pedagogy

Chalk and Talk , PPT, group discussion, seminar, interaction , problem solving , quiz

Course Learning Outcomes

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

CLOs	Course Learning Outcomes	Knowledge level
CLO1	Calculate and interpret heat and related properties using typical calorimetry/thermometry data.	K3
CLO2	Apply concepts of blackbody radiation and associated radiation laws to estimate the temperature of stars and other objects where thermometry and calorimetric estimates are not feasible.	K3
CLO3	Apply the principles of kinetic theory of gases to determine the macroscopic variables of real gases (including free electron gases)	K3
CLO4	Analyze real world thermodynamical system and apply the principles of thermodynamics to them and determine whether a process is reversible, irreversible or impossible.	K4
CLO5	Understand entropy as the law of nature & apply the same to thermodynamic systems.	K2

Mapping of CLOs with PSOs

	PSO–1	PSO–2	PSO–3	PSO–4	PSO–5	PSO–6	PSO–7
CLO–1	3		2	1			
CLO–2	3		2	1			
CLO–3	3		2	1			
CLO–4	3		2	1			
CLO–5	3		2	1			

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	1		
CLO2	3	2	1		
CLO3	3	2	1		2
CLO4	3	2	1		2
CLO5	3	2	1		1

Advance application –3; Intermediate level –2; Basic level–1

Blue print - Summative Examinations
(Mapping with Course Learning Outcomes (CLOs))

Units	CLOs	K-Level	Section A MCQs		Section B Short answers		Section C (Either or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K3	2	K1 & K2	1	K2	2 (K3& K3)	1 (K3)
4	CLO 4	Up to K4	2	K1 &K2	1	K2	2 (K4 & K4)	1 (K3)
5	CLO 5	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Physics				
Sem.	Course type	Course code	Course title	Credits	Contact hours / week	CIA	Ext	Total
II	Major Core – 4	20U2PMC4	OPTICS	3	3	25	75	100

Course Objectives:
1. Understand the concepts of rectilinear propagation of light.
2. Learn the basics of the dispersions in prisms and aberrations in lenses.
3. Apply the fundamental of the wave properties of light, applications associated with them and gain knowledge in the relevant field.

Unit-I: Lens & Prism

Fermat's principle of least time–Rectilinear propagation of light–Reversibility of light rays–Lenses–Introduction –Lens maker's formula– Dispersion–Angular dispersion –Angular and chromatic dispersion–Dispersive power–Deviations without dispersion–Dispersion without deviation–Direct vision spectroscope.
Self study: Terminology and Sign convention of lens.
Audit: Refractive index of a prism

Unit-II: Aberrations & Eye pieces

Aberrations–Spherical & chromatic aberrations–Longitudinal chromatic aberration for an object at infinity–Achromatic lenses – Condition for achromatism of two lenses placed in contact –Ramsden's and Huygens's eyepiece– Comparison of eye pieces.
Self study: Condition for achromatism of two lenses placed separated by a finite distance, Microscope.
Audit: Telescope

Unit-III: Interference

Introduction–Interference–Coherence–Conditions for interference –Thin film–Plane parallel film–Interference due to reflected light–Air wedge and Newton's ring theory –Michelson's Interferometer – theory and applications– Measurement of wavelength only.
Self study: Determination of wave length of light by Newton's ring, Determination of diameter of a thin wire by Air wedge.
Audit: Jamin's Interferometer.

Unit-IV: Diffraction

Introduction–Huygens's–Fresnel theory–Fresnel's assumptions–Rectilinear propagation of light–Zone plate–Fraunhofer diffraction at a single slit–Plane diffraction grating – Resolving power–Rayleigh's criterion–Resolving power of prism, grating and telescope.
Self study: Difference between Fresnel & Fraunhofer diffraction–Diffraction at a Circular Aperture– Determination of wavelength using grating.
Audit: Resolving power of microscope.

Unit-V: Polarization

Introduction–Polarization–Unpolarized light & Polarized light –Polarizer & analyzer–Anisotropic crystals–Double refraction in calcite crystal–Phase difference between extra ordinary ray & ordinary ray–Superposition of waves linearly polarized at right angles –Retarders–Quarter wave plate (QWP)–Half wave plate (HWP)–production and detection of elliptically and circularly polarized light–Optical activity–Optical rotation–Specific rotation.

Self study: Nicolprism and Laurent's half shade polarimeter.
Audit: Huygens explanation of double refraction.

Books for Study

1. A Text book of Optics by Dr.N.Subrahmanyam, Brijlal, &.Dr.M.N.Avadhanalu 25th revised edition, S.Chand& company Pvt Ltd., Reprint 2014.
    Unit I   2.2 – 2.4, 4.1, 4.9, 4.10 (excluding 4.10.1), 8.1 – 8.8.
    Unit II   9.2, 9.5, 9.10, 9.11. A, 9.13, 9.13.1, 10.10 –10.12.
    Unit III 14.1, 14.4, 14.6, 14.7, 15.1 – 15.2.3, 15.5, 15.5.1, 15.6– 15.6.3, 15.7, 15.8, 15.8.

Unit IV   17.1–17.5.1, 18.1, 18.2 only, 18.7, 18.7.1, 18.7.2, 19.1, 19.2, 19.11, 19.12.
Unit V20.1 – 20.3, 20.8, 20.10, 20.11(excluding 20.11.1 – 20.11.3), 20.17–20.22, 20.27–20.29.

Books for References

1. R.Murughesan , Optics & Spectroscopy , 5th revised edition 2005, S.Chand& Co Ltd.,
2. A.B.gupta, Modern optics , II [nd] edition, 2010 , Books & Allied (p) Ltd.
3. Jenkins & White, Fundamentals of Optics , 4th edition, 2014 , Mc Graw Hill International Edition.
4. Sathyaprakash, Optics , VIIth edition, 1990 ,Ratan PrakashanMandhir, New Delhi,
5. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14th edition , 2017 , Pearson India Education Services Pvt.Ltd.
6. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
7. Paul G. Hewitt ,*CONCEPTUAL PHYSICS*, (10th edition 2015), Pearson Education, Inc. and Dorling Kindersley Publishing Inc.

Web Resources

Interference
1. http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
2. https://en.wikipedia.org/wiki/Interfernce

Newton rings
3. http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1

Wing scales cause light to diffract and interfere
4. https://asknature.org/strategy/wing-scales-cause-light-to-diffract-and-interfere/
5. http://www.scienceclarified.com/diffraction

Lens and polarization
6. https://www.britannica.com/lens/polaization

Course Designer(s):

1. Dr.M.Kavitha
2. Mr. V.Meenakshi Sundaram
3. Mr. S.Ramakrishnan

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Fermat's principle of least time, Rectilinear propagation of light, Reversibility of light rays, Lenses.	3	PPT, Chalk and talk, Quiz and assignment
	Introduction ,Lens maker's formula, Dispersion, Angular dispersion	3	
	Angular and chromatic dispersion, Dispersive power Deviations without dispersion, Dispersion without deviation, Direct vision spectroscope.	3	
Unit II	Aberrations, Spherical & chromatic aberrations Longitudinal chromatic aberration for an object at infinity	3	Chalk and talk, Quiz and assignment
	Achromatic lenses , Condition for a chromatism of two lenses placed in contact	3	
	Ramsden's and Huygens's eyepiece, Comparison of eye pieces	3	
Unit III	Introduction, Interference, Coherence, Conditions for interference	3	Chalk and talk, Quiz, assignment and seminar
	Thin film, Plane parallel film, Interference due to reflected light. Air wedge	3	
	Newton's ring theory, Michelson's Interferometer theory and applications, Measurement of wavelength only.	3	
Unit IV	Introduction, Huygens- Fresnel theory, Fresnel's assumptions	2	Chalk and talk, quiz, Group discussion
	Rectilinear propagation of light, Zone plate	2	
	Fraunhoffer diffraction at a single slit, Plane diffraction grating	2	
	Resolving power, Rayleigh's criterion Resolving power of prism, grating and telescope	3	
Unit V	Introduction, Polarization, Unpolarized light & Polarized light.Polarizer& analyzer, Anisotropic crystals, Double refraction in calcite crystal	3	PPT, Chalk and talk, Quiz and Interaction
	Phase difference between extra ordinary ray & ordinary ray, Superposition of waves linearly polarized at right angles	2	
	Retarders, Quarter wave plate (QWP) Half wave plate (HWP),production and detection of elliptically and circularly polarized light	3	
	Optical activity, Optical rotation, Specific rotation.	1	

Pedagogy

Chalk and talk , materials, PPT, Quiz, Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

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

CLO	Course Learning Outcomes	Knowledge Level
CLO–1	Apply the knowledge of dispersion of lens and prism and to solve real life problems related to the phenomena.	UptoK3
CLO–2	Analyze the production of lenses by studying the phenomena of aberrations.	UptoK4
CLO–3	Describe the theory and experiment of interference using air wedge, Newtons ring and Michelson interferometer.	UptoK2
CLO–4	Illustrate the important and fascinating areas of diffraction to solve the wavelength of spectral lines using plane diffraction grating.	UptoK3
CLO–5	Evaluate the principles of wave motion and superposition to explain the polarization.	UptoK3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3	2	3	1			3
CLO2	3	2	3	1			3
CLO3	3	2	3	1			3
CLO4	3	2	3	1			3
CLO5	3	2	3	1			3

Mapping of CLO's with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2			
CLO2	3	2		2	1
CLO3	3				
CLO4	3	2	1	1	2
CLO5	3	1	1	1	2

Advance application –3;Intermediate level –2; Basic level–1

Summative - Blue – Print - Model
(Mapping with Course Learning Outcomes (CLOs))

Units	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short answers No. of Questions	Section B Short answers K-Level	Section C (Either or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K3)
2	CLO 2	Up to K4	2	K1 & K2	1	K2	2 (K4& K4)	1 (K4)
3	CLO 3	Up to K2	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K2)
4	CLO 4	Up to K3	2	K1 & K2	1	K1	2 (K3& K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Mathematics/IIChemistry				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
I/III	Allied–I	20U1PAC1/ 20U3PAC1	ALLIED PHYSICS - I	4	4	25	75	100

Course Objectives:

1. Understand the concept of strength of materials and viscous properties of liquids.
2. Import the concept of heat in doing mechanical work.
3. Understand the basic properties of light such as interference and diffraction.

Unit-I: Properties of Matter

Elasticity- units and dimension – Stress – Strain – Elastic limit- Hooke's law - Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition only) – Relation between the three moduli- Theory of torsional pendulum. Bending of beams – Expression for bending moment –Determination of young's modulus – Non–uniform bending–Theory and experiment– Pin and microscope method only.

Self Study: Experiment to determine the rigidity modulus of a wire and M.I. of a disc without symmetrical mass by torsion pendulum method.

Audit: Uniform bending theory and Experimental determination of young's modulus by scale and telescope method.

Unit-II: Viscosity

Introduction – Co–efficient of viscosity – Units and dimensions –Stream line motion and Turbulent motion - Equation of continuity – Bernoulli's theorem – Statement and proof – Venturimeter – Wings of an aeroplane - Poiseuille's formula for co–efficient of viscosity of a liquid- Determination of coefficient of viscosity using burette method- Stoke's formula (dimension method only) – Experiment to determine viscosity of a highly viscous liquid.

Self Study: Pitot tube .

Audit: Comparison of Viscosities.

Unit-III: Conduction, Convection and Radiation   (12 hrs)

Specific heat capacity of solids and liquids – Dulong and Petit's law – Newton's law of cooling –. Thermal conduction –Coefficient of thermal conductivity by Lee's disc method. Thermal radiation - Black body radiation – Distribution of energy in black body spectrum – Planck's radiation law – Rayleigh Jean's law, Wien's displacement law – Stefan's law of radiation. (No derivations).

Self Study: Convention process – Lapse rate – Green house effect.

Audit: Specific heat capacity of a liquid by cooling.

Unit-IV: Thermodynamics   (12 hrs)

Zeroth and I Law of thermodynamics (Statement only) – Carnot's engine and Carnot's cycle – Efficiency of a Carnot's engine – II law and III law of thermodynamics (Statement only) – Entropy – Change in entropy in reversible and irreversible process – Change in entropy of a perfect gas.

Self Study: Change in entropy when ice is converted into steam.

Audit: Isothermal and Adiabatic process

Unit-V: Optics

Interference – interference due to reflected light – Condition for maxima and minima - Air wedge – thickness of a thin wire – Newton's rings – Determination of wavelength using Newton's rings. Diffraction – Difference between diffraction and interference – Theory of transmission grating – Polarisation – optical activity –Specific rotatory power (Definition only)

Self Study: Determination of wavelength using grating by Normal incidence method.

Audit: Biot's law, Laurent's half shade polarimeter

Books for Study

1. **Properties of matter – Brijlal and Subramanyam – Eurasia Publishing co.,New Delhi, III Edition 1983.**
   Unit I – 6.1, 6.2, 6.6(Definition only) – 6.16,6.18, 6.19, 6.22,
   Unit II – 7.2,7.3, 7.5, 7.7(1,6), 7.9, 7.10,7.11.

2. **Heat Thermodynamics and Statistical Physics –Brijlal, Dr. N. Subrahmanyam and P.S. Hemne, S.Chand& Co, 16th Edition 2005**
   Unit III – 14.1, 14.5, 14.17, 15.1, 15.10, 15.11 8.1,8.6, 8.8, 8.12, 8.13, 8.14, 8.15, 8.17,.
   Unit IV – 4.2 (Statement only), 4.7, 4.21, 4.22, 4.23, 4.24, 4.28(Statement only), 5.1, 5.2, 5.4, 5.6, 5.9,5.15(Statement only).

3. **A text book of Optics – Subramanyam and Brijlal, S. Chand and co..NewDelhi, 22nd Edition 2004.**
   Unit V – 14.4, 15.2.1, 15.2.2 , 15.5, 15.5.1, 15.5.2, 15.6, 15.6.1, 15.6.7, 17.1, 17.6, 18.7, 18.7.1, 20.2, 20.27, 20.29.

4. **Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14 th edition ,2017, Pearson India Education Services Pvt.Ltd.**

Applications: Unit I: Examples 11.5–11.7 (Pages 371–376).
   Unit II: Examples 12.7–12.10 (Pages 405–409).
   Unit III: Examples 17.5,17.6,17.11 – 17.15 (Pages 581–582, 589–595).
   Unit IV : Examples 19.2 ,19.5, 20.2,20.4 – 20.7,20.10. (Page 648–652, 678– 680,684,686, 689– 691,693.
   Unit V: Examples 35.4–35.6 (Pages 1197–1198)

Books for References

1. Element of properties of matter,D.S.Mathur,2001 S.Chand& Company Ltd,New Delhi,
2. Heat and Thermodynamics,Brijlal& Subramanyam, 16th Edition 2005,S.Chand & Co,
3. Heat and Thermodynamics , D.S. Mathur, 5thEdition 2014,SultanChand & Sons,
4. Optics and Spectroscopy ,R.Murugeshan, 6thEdition 2008,S.Chand and co.,
5. Optics ,Sathyaprakash, 7thEdition 1990,Ratan PrakashanMandhir, New Delhi,
6. D. Halliday, R.Rensick and J. Walker, Fundamentals of Physics , 6th edition, 2001,Wiley Eastern Limited.
7. Paul G. Hewitt *CONCEPTUAL PHYSICS*, (tenth edition), Pearson Education, Inc. and Dorling Kindersley Publishing Inc.2015.

Web Resources

1. Applications of Elastic Behaviour of Materials
   https://www.toppr.com/guides/physics/mechanical-properties-of-solids/applications-of-elastic-behaviour-of-materials/
2. Modulus of Elasticity of Concrete
   https://civiltoday.com/civil-engineering-materials/concrete/84-modulus-of-elasticity-of-concrete

3. Beam bending
   https://realizeengineering.files.wordpress.com/2013/09/5eplannos8_beambendingskateboarder1.pdf
4. Draw Bending Moment & Shear Force Diagrams –
   CantileverBeamhttps://www.youtube.com/watch?v=QPgdfWooEDc
5. Viscosity Examples
   https://www.lifepersona.com/the-10-most-known-viscosity-examples
6. Viscosity, Application, Flow and Factors
   https://schoolworkhelper.net/what-is-viscosity-application-flow-factors/
7. Viscosity
   https://sciencing.com/fluid/
8. Dynamics of fluid motion
   https://realizeengineering.files.wordpress.com/2013/10/5eplannof4dynamics-of-fluid-motion1.pdf
9. Conduction:
   http://htv-au.vlabs.ac.in/Heat_Transfer_by_Conduction/experiment.html
10. Examples of Convection
    https://studiousguy.com/examples-convection-everyday-life/
11. Radiation
    http://htv-au.vlabs.ac.in/Heat_Transfer_by_Radiation/experiment.html
    http://htv-au.vlabs.ac.in/Black_Body_Radiation/experiment.html
12. Examples of the First & Second Laws of Thermodynamics
    https://education.seattlepi.com/everyday-examples-first-second-laws-thermodynamics-4740.html
13. 2nd Law of thermodynamics
    https://realizeengineering.files.wordpress.com/2013/10/5eplannot3_second-law.pdf
14. Thermodynamics
    https://sciencing.com/thermodynamics/
15. Entropy
    https://realizeengineering.files.wordpress.com/2013/10/5eplannot4_entropy.pdf
16. Interference
    http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
17. Newton rings
    http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1
18. Wing scales cause light to diffract and interfere
    https://asknature.org/strategy/wing-scales-cause-light-to-diffract-and-interfere/

Course Designer(s):
1. Mr. V.Meenakshi Sundaram
2. Dr. M.Revathi
3. Mr. M.Megala

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Elasticity, units and dimension , Stress , Strain , Elastic limit, Hooke's law, Young's modulus , Rigidity modulus , Bulk modulus Poisson's ratio	**3**	**Chalk and talk, Quiz and assignment**
	Relation between the three moduli	**2**	
	Theory of torsional pendulum,Bending of beams, Expression for bending moment	**3**	
	Determination of young's modulus , Non–uniform bending , Theory	**2**	
	Non–uniform bending, experiment, Pin and microscope method and problems	**2**	
Unit II	Viscosity , Co–efficient of viscosity , Units and dimensions, Stream line motion and Turbulent motion, Equation of continuity	**3**	**Chalk and talk, quiz, Group discussion**
	Bernoulli's theorem , Statement and proof and applications	**2**	
	Venturimeter, Wings of an aeroplane and problems	**2**	
	Poiseuille's formula for co–efficient of viscosity of a liquid, Determination of coefficient of viscosity using burette method and problems	**3**	
	Stoke's formula (dimension method only), Experiment to determine viscosity of a highly viscous liquid.	**2**	
Unit III	Specific heat capacity of solids and liquids, Dulong and Petit's law	**2**	**Chalk and talk, Quiz and assignment**
	Newton's law of cooling	**2**	
	Thermal conduction ,Coefficient of thermal conductivity by Lee's disc method	**2**	
	Thermal radiation , Black body radiation , Distribution of energy in black body spectrum	**2**	
	Planck's radiation law , Rayleigh Jean's law and discussion	**2**	
	Wien's displacement law , Stefan's law of radiation and problems	**2**	
Unit IV	Zeroth and I Law of thermodynamics	**2**	**PPT, Chalk and talk, Quiz and assignment**
	Carnot's engine	**2**	
	Carnot's cycle ,Efficiency of a Carnot's engine	**2**	
	II law of thermodynamics	**1**	
	Entropy , Change in entropy in reversible and irreversible process	**2**	
	Change in entropy of a perfect gas and problem discussion	**3**	
Unit V	Interference, interference due to reflected light, conditions for interference maxima and minima	**2**	**PPT, Chalk and talk, Quiz and assignment**
	Air wedge , thickness of a thin wire	**2**	
	Newton's rings , Determination of wavelength using Newton's rings	**3**	
	Diffraction , Difference between diffraction and interference , Theory of transmission grating	**3**	
	Polarisation , optical activity , Specific rotatory power,	**2**	

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , interaction and field visit.

Course Learning Outcomes

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

CLO No.	Course Learning Outcomes	Knowledge Level
CLO 1	Connect the principles of elasticity of a body such as tension, compression and shear in construction and allied fields	UptoK3
CLO 2	Use the dynamics of fluid motion to solve the practical applications problems.	UptoK3
CLO 3	Compare the conduction, convection and radiation process to solve the real life problems.	UptoK4
CLO 4	Use the laws of thermodynamics to heat engines.	UptoK3
CLO 5	Apply the wave nature of light to real life situations.	UptoK3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3			2			
CLO2	3			2			
CLO3	3			2			
CLO4	3			2			
CLO5	3			2			

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	2
CLO2	3	2	2	2	
CLO3	3	2	2	2	
CLO4	3	2	2	2	2
CLO5	3	1		1	

Advance application –3;Intermediate level –2;   Basic level–1

Summative - Blue – Print - Model
(Mapping with Course Learning Outcomes(CLOs))

Units	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short answers No. of Questions	Section B Short answers K-Level	Section C (Either or Choice)	Section D (Open Choice)
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K1	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2 (K3& K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Mathematics/IIChemistry				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
II/IV	Allied– II	20U2PAC2/ 20U4PAC2	ALLIED PHYSICS - II	4	4	25	75	100

Course Objectives:
1. The students will be able to
2. Understand the concepts of resistance of materials and capacity of conductors.
3. Illustrate the effect of magnetic field and the process of alternating current.
4. Explain the idea of the atom models and to analyse the basic properties of nucleus.
5. Learn the basic ideas of semiconductor diodes, transistor and logic gates.

Unit-I: Current Electricity
Capacitance – Definition – Unit - Principle of a capacitor – Capacitors in series and parallel – Ohms law – Resistance and Resistivity – Resistors in series and parallel – Kirchhoff's law – Wheatstone's network – Condition for balance – Carey–Foster's bridge – Measurement of resistance – Measurement of specific resistance – Potentiometer – Calibration of low range Voltmeter.
Self Study: Determination of temperature coefficient of resistance.
Audit: Calibration of High range voltmeter.

Unit-II: Electromagnetism
Electromagnetic Induction – Faraday's law – Lenz's law – Self inductance- Self inductance of a long solenoid - Mutual inductance –.Mutual inductance of two solenoids - A.C. Circuits – Mean value – RMS value – Peak value. LCR in series circuit – Impedance – Resonant frequency – Q factor.
Self Study: Applications of inductors.
Audit: Coefficient of coupling

Unit-III: Atomic and Nuclear Physics
Bohr atom model – Ionisation Potential – Atomic excitation – Frank – Hertz experiment –   X–rays – Production – Derivation of Bragg's law – Properties of nuclei – Isotopes – Radio isotopes , Uses of radio isotopes - Nuclear binding energy – Nuclear fusion and Nuclear fission(Definition).
Self Study: X ray uses in industrial and medical fields.
Audit: Properties of X-rays

Unit-IV: Analog Electronics
Semiconductor – Intrinsic Semicondutor - Extrinsic semiconductor – Mobile Charge carriers and immobile ions – P N junction diode – Zener diode –Forward bias – Reverse bias - Bridge rectifier - Transistor – transistor biasing – CE configuration – Transistor characteristics (CE configuration only) – CE amplifier.
Self Study: Current gain relationship between α and β.
Audit:, Majority and minority carriers.

Unit-V: Digital Electronics

Number system – Decimal, binary, octal and hexadecimal system – Binary addition, subtraction and multiplication – Conversion of one number system to another number system. Logic gates – OR, AND, NOT, Ex–OR, NAND gates – Truth tables – Law and theorems of Boolean's algebra – De –Morgan's theorem.

Self Study: NOR Gate.

Audit: Half adder.

Books for Study

1. BrijLal& Subramanyam, Electricity and Magnetism,(2005),Ratan Prakashan Mandir Publishers.
   Unit I :7.1(i) ,7.2, 7.6 , 13.1 , 13.3 , 13.6 ,13.7 , 13.21 , 13.22 , 13.32 , 13.35 , 13.41(2).
   Unit II: 18.1 , 18.2 , 18.6 , 18.7 , 18.9 , 18.13 , 18.14 , 20.1 , 20.10 , 20.23(iii)

2. R Murugeshan and KiruthigaSivaprasath, Modern Physics, 2014,S.Chand&Co.Ltd.
   Unit III – 6.4 , 6.8 , 6.9 , 6.10(1) , 7.1 , 7.2 , 7.6 , 27.1 – 27.4 , 34.11, 35.2 , 35.7.

3. B. L. Theraja , Basic Electronics Solid State , 2012 , S.Chand&Co.Ltd.
   Unit IV: 12.22 – 12.27 , 13.1 – 13.3 , 13.5 – 13.7 , 13.9 , 15.1, 17.8 , 18.1 , 18.2 , 18.8 , 19.4 , 19.5 , 22.5 – 22.7 ,
   Unit V: 32.1 – 32.7 , 32.9 – 32.11 , 32.15, 32.19 – 32.23 , 32.25 – 32.28 , 33.1 , 33.3 , 33.5 , 33.7 , 33.9 , 33.10 , 33.12 , 33.14 , 33.15 , 33.16 , 33.17 , 33.21 , 33.22 , 34.1 – 34.3 , 34.5.

4. Sear's and Zemansky's "University Physics with Modern Physics '', Hugh D.Young and Roger A. Freedman , 14 th edition ,2017, Pearson India Education Services Pvt.Ltd.
   Applications :
   Unit I: Examples 24.5 , 24.6 , 25.2(c) , 25.3 , 26.1 – 26.7. (Pages 810, 814–817, 844–850, 872–882).
   Unit II: Examples 29.1 , 29.2 , 30.4 (Pages 979–984, 989, 990, 1018–1021).
   Unit III:Examples 36.5 , 38.4 , 39.5 , 43.1 , 43.3. (Pages 1225–1228, 1284 – 1286 , 1316 , 1464–1466, 1470–1471).

Books for References

1. R Murugeshan , Electricity and Magnetism , 2011 , S.Chand&Co.Ltd.
2. M.Narayanamurthy&N.Nagarathnam, Electricity & Magnetism, NPC pub., Revised edition.
3. R Murugeshan , Allied Physics, 2018 , S.Chand&Co.Ltd.
4. D.C.Tayal , Electricity and Magnetism , 1999 , Himalalaya Publishing Co.
5. D. Halliday, R.Rensick and J. Walker , Fundamentals of Physics, 6th edition, 2001,Wiley Eastern Limited.
6. V.K. Mehta, Rohit Mehta , Principles of Electronics , 2006 , S. Chand & Co.
7. D.L.Sehgal, K.L.Chopra and N.K.Sehgal , Modern Physics , 7th Edition, 1991 , Sultan Chand & Sons.
8. N. Subrahmanyam and BrijLal , Atomic and Nuclear Physics , 2000 , S. Chand & Co.
9. MalvinoLeach , Digital Principles and Application , 4thEdition , 1992 , Tata McGraw Hill.

Web Resources

Capacitors:

1. https://revisionworld.com/a2–level–level–revision/physics/fields–0/capacitors
2. https://www.birmingham.ac.uk/undergraduate/preparing–for–university/stem/Physics/stem–legacy–capacitors.aspx
3. https://isaacphysics.org/concepts/cp_capacitor
   https://www.arrow.com/en/research-and-events/articles/capacitor-basics-definition-uses-and-and-
      formulas-in-series-and-parallel

Carey Foster bridge:
5. https://electricalvoice.com/carey–foster–bridge–working–advantages–applications/

Electromagentic Induction:
6. https://www.toppr.com/guides/physics/magnetic–effects–of–electric–current/electromagnetic–induction–and–its–applications/
7. https://sciencing.com/what-electromagnets-used-everyday-life-4703546.html
8. https://www.electronicshub.org/applications-of-electromagnetism/

LCR Series Resonance Circuit:
9. http://vlab.amrita.edu/?sub=3&brch=75&sim=330&cnt=1

Bohr Atom Model:
10. https://www.toppr.com/guides/chemistry/structure–of–atom/bohrs–model–of–atom/

Frank Hertz Experiment:
11. https://vlab.amrita.edu/?sub=1&brch=195&sim=355&cnt=1
12. https://www.britannica.com/science/Franck–Hertz–experiment
13. https://ocw.mit.edu/courses/physics/8–13–14–experimental–physics–i–ii–junior–lab–fall–2016–spring–2017/experiments/the–franck–hertz–experiment/MIT8_13–14F16–S17exp7.pdf

Application of X rays:
14. https://science.jrank.org/pages/7433/X–Rays–Applications–x–rays.html

Radio Isotopes
15. https://www.britannica.com/science/radioactive–isotope

Nuclear Energy
16. http://www.energy.gov.za/files/media/Pub/NuclearEnergyInEverydayLife_Booklet.pdf

Semiconductors:
17. http://www.learnabout–electronics.org/Semiconductors/semiconductors_01.php

Applications of NAND Gates:
18. http://www.schoolphysics.co.uk/age16-19/Electronics/Logic%20gates/text/Logic_gates_applications/index.html

Course Designer(s):
1. Prof. V.Meenakshi Sundaram
2. Prof. M.Venkateshan
3. Dr. P. Pandi

Lecture Schedule

Unit	Topics	Hours	Mode
Unit I	Capacitance , Definition , Unit , Principle of a capacitor Capacitors in series and parallel	**2**	**Chalk and talk, Quiz and assignment**
	Ohms law , Resistance and Resistivity , Resistors in series and parallel	**2**	
	Kirchhoff's law , Wheatstone's network , Condition for balance	**3**	
	Carey–Foster's bridge ,Measurement of resistance, Measurement of specific resistance	**3**	
	Potentiometer ,Calibration of low range Voltmeter.	**2**	
Unit II	Electromagnetic Induction, Faraday's law, Lenz's law	**3**	**PPT Chalk and talk, quiz, Group discussion**
	Self inductance, Self inductance of a long solenoid, Mutual inductance , Mutual inductance of two solenoids	**3**	
	A.C. Circuits , Mean value , RMS value , Peak value	**3**	
	LCR in series circuit , Impedance , Resonant frequency, Q factor.	**3**	
Unit III	Bohr atom model	**2**	**Chalk and talk, Quiz and assignment**
	IonisationPotential , Atomic excitation	**2**	
	Frank – Hertz experiment	**2**	
	X–rays ,Production , Derivation of Bragg's law ,	**2**	
	Properties of nuclei , Isotopes, Radio isotopes , Uses of radio isotopes Nuclear binding energy	**2**	
	Nuclear fusion and Nuclear fission	**2**	
Unit IV	Semiconductor , Intrinsic Semicondutor , Extrinsic semiconductor, Majority and minority carriers, Mobile Charge carriers and immobile ions	**2**	**Chalk and talk, Quiz and assignment**
	P N junction diode ,	**2**	
	Zener diode, Forward bias , Reverse bias	**2**	
	Bridge rectifier	**1**	
	Transistor ,Working of a transistor , CE configuration	**2**	
	Transistor characteristics (CE configuration only)	**2**	
	CE amplifier	**1**	
Unit V	Number system , Decimal, binary, octal ,hexadecimal system and Conversion of one number system to another number system	**3**	**Chalk and talk, Quiz and assignment seminar**
	Binary addition, subtraction and multiplication	**2**	
	Logic gates , OR, AND, NOT, Ex–OR, truth tables	**2**	
	NAND gates , Truth tables	**2**	
	Law and theorems of Boolean's algebra	**2**	
	De–Morgan's theorem.	**1**	

Pedagogy

Chalk and talk , materials, PPT, Quiz , Assignment , Seminar , Problem solving , Group discussion , intraction and field visit.

Course Learning Outcomes

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

CLOs	Course Learning Outcome	Knowledge level
CLO –1	Apply Kirchhoff's laws to analyze circuits involving resistance, capacitance and voltage source including ac and dc Wheatstone's bridges	Upto K3
CLO –2	Use Laws of electromagnetic induction to day to day life appliances like induction stove, transformer, choke etc.,	Upto K3
CLO –3	Analyse the Physics of particles at the atomic and nuclear scale and appreciate the implications of the Bohr model of the atom, X–ray diffraction, nuclear stability and radioactivity	Upto K4
CLO –4	Understand the principle working and operation of rectifiers, regulators, oscillators and amplifiers along with characteristic parameters of operation and their construction from basic active semiconductor devices like diodes and transistors.	Upto K3
CLO –5	Apply principle of Boolean algebra for simplification and realization of digital circuits using logic gates.	Upto K3

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3						
CLO2	3						
CLO3	3						
CLO4	3						
CLO5	3						
CLO6	3						

Mapping of CLOs with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	3	2		2	
CLO2	3	2		2	
CLO3	3		2	2	2
CLO4	3	2	2	2	2
CLO5	3	2	2	2	2

Advance application –3; Intermediate level –2; Basic level–1

Summative (External) - Blue – Print - Model
(Mapping with Course Learning Outcomes(CLOs))

Units	CLOs	K-Level	Section A MCQs		Section B Short answers		Section C (Either or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K1	2 (K1 & K1)	1 (K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2 (K2 & K2)	1 (K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1 (K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1 (K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total marks for each			**10**		**10**		**25**	**30**

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

DEPARTMENT OF PHYSICS				CLASS: I B.Sc. Physics				
Sem.	Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
I&II	Major Practical	20U2PMP1	MAJOR PRACTICAL - I	3	3	40	60	100

List of Experiments (Any fourteen/year)

Course Objectives:

1. To expose the students to experiments in the areas of Mechanics, properties of matter, Heat and Sound. This Experimental physics course provides hands– on learning experience in measuring the concepts that are learnt theoretically.
2. Laboratory techniques with accuracy in measurements and data analysis enhance effective comprehension of physics concepts.

No.	Experiment
1	Young's Modulus – Uniform bending (pin and microscope)
2	Young's Modulus – Non–uniform bending (pin and microscope)
3	Young's Modulus – Uniform bending (scale and telescope)
4	Young's Modulus – Non–uniform bending (scale and telescope)
5	Young's modulus – Cantilever depression
6	Acceleration due to gravity and the radius of gyration – Compound pendulum
7	Rigidity modulus – Torsion pendulum (with symmetrical masses)
8	Rigidity modulus – Static torsion (scale and telescope)
9	Surface Tension of water and Interfacial Surface Tension – Drop weight method
10	Surface tension of water – Capillary rise method
11	Comparison of viscosities – Capillary flow
12	Co–efficient of viscosity – Stoke's method
13	Co–efficient of viscosity – Poiseulli's flow
14	Co–efficient of linear expansion of rod
15	Specific heat capacity of liquid – Cooling method
16	Latent heat of steam – Newton's law of cooling
17	Thermal conductivity – Lee's Disc
18	Frequency of the tuning fork –Sonometer
19	Frequency of the vibrator– Melde's string
20	Determination of the radius of curvature of the give lens – Newton's rings.
21	Determination of the thickness of the given material– Air wedge
22	Determination of the refractive index of a given prism – Spectrometer.
23	Determination the wavelength of the prominent line using grating – Spectrometer
24	Any experiment related to general physics

Books for References

1. M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, A Text Book of Practical Physics, 2007, Sultan Chand & Sons.
2. Indu Prakash & Ramakrishna, A Text Book of Practical Physics, 2011, Kitab Mahal Agencies, New Delhi. .S.R. GovindaRajan, T. Murugaiyan, S. SundaraRajan, Practical Physics, 2007, Rochouse & Sons.
3. Relevant reference from web Sources.

Course Designers:

1. Dr.R.Vishnu Priya
2. MsG.Gowri
3. Dr.J.Sivasubramanian

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

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

CLOs	Course Learning Outcomes	Knowledge level
1	Apply the basic laws of physics to determine the various properties of the given materials.	Upto K3
2	Apply knowledge of physics and mathematics to derive solution for various problems.	Upto K3
3	Use the basic laws to study the elastic properties of solids and thermal properties of liquids and solids.	K1
4	Analyse the property of the material by experimenting in different methods.	Upto K4
5	Understand the application of materials.	Upto K2

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3	2		3		2	3
CLO2	3	3	3	3		3	2
CLO3	3	2		3		2	3
CLO4	3	3	2	3		2	2
CLO5	3	2	1	3		2	3

Mapping of CLO's with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	1	3			
CLO2	1	3	2		
CLO3		3	1		
CLO4	1	3	2		
CLO5		3	2		

Advance application –3; Intermediate level –2;   Basic level–1

DEPARTMENT OF PHYSICS			CLASS: I B.Sc. Mathematics/IIChemistry				
Course type	Course code	Course title	Credits	Contact hours/week	CIA	Ext	Total
Allied Practicals	20U2PAP1 / 20U4PAP1	ALLIED PRACTICAL - I	2	2	40	60	100

Ancillary Physics Practicals (Any fourteen only/year)

Course Objectives:

1. To expose the students to experiments in the areas of properties of matter , thermal physics , Electricity &magnetism, optics and electronics.

No.	Experiments
1	Young's modulus – Non– uniform bending –pin & microscope
2	Young's modulus – Uniform bending –scale and telescope
3	Torsional pendulum – Determination of rigidity modulus
4	Comparison of viscosities using Poiseuilli's method
5	Poiseulli's flow method – Determination of viscosity
6	Stoke's method – Viscosity of highly viscous liquid
7	Linear expansion of the rod
8	Specific heat capacity – Cooling method
9	Lee's disc – Determination of thermal conductivity of a bad conductor
10	Latent heat of steam
11	Compound pendulum – Determination of 'g'
12	Surface tension of water – Drop weight method
13	Sonometer – Determination of frequency of tuning fork
14	Determination of the radius of curvature of the give lens – Newton's rings.
15	Determination of the thickness of the given material– Air wedge
16	Determination of the refractive index of a given prism – Spectrometer.
17	Determination the wavelength of the prominent line using grating – Spectrometer
18	Determination of the focal length of the given long focus convex lens by different methods
19	Comparison of capacitances – De Sauty's bridge.
20	Calibration of low range voltmeter – Potentiometer
21	Determination of pole strength of the magnet – Tan C position
22	Logic gates using discrete components.
23	Characteristics of Zener diode.
24	Universality of NOR gate.
25	Universality of NAND gate.
26	Verification of de – Morgan's theorem using IC's
27	Half adder and full adder.
28	Any experiment related to general physics

Books for References

1. M.N.Srinivasan, S.Balasubramanian, R.Ranganathan, A Text Book of Practical Physics, 2007, Sultan Chand & Sons.
2. Indu Prakash &Ramakrishna, A Text Book of Practical Physics, 2008, Kitab Mahal Agencies
3. S.R. GovindaRajan, T. Murugaiyan, S. SundaraRajan, Practical Physics, 2006, Rochouse& Sons
4. Relevant reference from web Sources.

Course Designer(s):

1. Mr.V.Meenakshi Sundaram
2. Mr.T.Vivekanandan
3. G.Gowri

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLOs)

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

CLOs	Course Learning Outcomes	Knowledge level
1	Apply the basic laws of physics to determine the various properties of the given materials.	Upto K3
2	Apply knowledge of physics and mathematics to derive solution for various problems.	Upto K3
3	Use the basic laws to study the elastic properties of solids and thermal properties of liquids and solids.	K1
4	Applies logic gates to form simple circuits.	Upto K3
5	Analyse the property of the material by experimenting in different methods.	Upto K4

Mapping of CLO's with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	3						
CLO2	3						
CLO3	3						
CLO4	3						
CLO5	3						

Mapping of CLO's with POs

#	PO1	PO2	PO3	PO4	PO5
CLO1	1	3			
CLO2	1	3	2		
CLO3	1	3	1		
CLO4	1	3	2		
CLO5		3	2		

Advance application –3; Intermediate level –2;   Basic level –1

DEPARTMENT OF PHYSICS			Value Added Course				
Course Type	Course Code	Course Code Course Title	Credits	Total Contact Hours	CIA	Ext	Total
Value Added Course		Advanced techniques for smart phone service and troubleshooting	2	30			

Training outcomes:
1. At the end of the training, the trainee will be able to Appreciate the importance of embarking on self employment and has developed the confidence
2. Identify business opportunities in chosen sector / sub-sector and plan and market and sell
3. Start a small business enterprise by liaising with different stake holders
4. Effectively manage small business enterprise
5. Establish and run a Mobile Handset Repairing unit
6. Repair and Diagnose the Problem of all kinds of faults in Mobile Phone handsets in Hardware as well Software and rectify the faults using tools and equipment and various software.
7. Use appropriate tools, spares and software updates, conduct test for repairs
8. Ensure admittance of faulty handsets, prioritize and conduct repair activities in time to ensure customer satisfaction.

Module-I
Introduction to mobile phones – Current- Voltage- Usage of Digital Multimeter - Resistors, Capacitors and coils –Diodes & Transistors -Gates – OR , NOT, AND – De Morgan's theorem and proof – universal gates

Module-II
Introduction to Hardware &materials - Speaker, Microphone, Vibrate motor, Diplay, Drivers, Power switch, Crystal ICs & SMD's -Identification of the different parts of mobile .

Module-III
Basics of Mobile Electronics - Smart Phone Trouble shooting Block Diagram-Mobile Accessories Innovative applicatio of Mobile App.

Module-IV
Practical works
   ❖ Finding mobile model
   ❖ Use of various Tools & Instruments used in mobile phone repairing
   ❖ Assembling & Disassembling
   ❖ Testing of various parts with Multimeter
   ❖ Testing of Mic, Speaker, Ringer, Vibrator, LCD, Antenna using Multimeter
   ❖ Finding faults and replacing the faulty parts
   ❖ Soldering & De-soldering
   ❖ Jumpering
   ❖ Touch /Display Replacement
   ❖ Two types of mobile testing

- ➢ Continuity test
- ➢ Voltage test
- ❖ Mic, Speaker, Ringer trouble shooting Solutions
- ❖ Insert SIM /No signal solution
- ❖ Charging Solution
- ❖ IC Replacement
- ❖ Keypad Problem
- ❖ Touch Screen Problem
- ❖ Network Problem
- ❖ Dead Mobile trouble shooting
- ❖ All Hardware Problem
- ❖ SIM tray/Memory tray Replacement
- ❖ Charging Connecter pin Replacement
- ❖ Battery Connecter and Head Set pin Replacement

How to Solder and De-solder a component using Blower

(CC pin, BCP pin, SIM tray, Memory tray, Head set pin, All mobile IC's).

Module-V

Software

- ❖ What Is Flashing?
- ❖ Flashing Tools
- ❖ Flashing Method
- ❖ Pattern Lock
- ❖ Password Lock
- ❖ Hanging
- ❖ Logo Hanging
- ❖ Auto ON/OFF
- ❖ Restart
- ❖ SIM lock
- ❖ Unfortunately Google Chrome/Settings/Whats App has Stopped
- ❖ Formatting of Virus affected handsets
- ❖ Flashing of various brands of handsets
- ❖ Unlocking of handset through codes and software.
- ❖ Use of Secret Codes.

Text Book

Course Materials prepared by the course teacher(s)

Books for References

1. H S Kalsi, Electronic instrumentation, 2012, 3rd Edition, Tata McGraw – Hill Education.
2. Helfrick and cooper, Modern electronic instrumentation and measurement techniques, 2016, Pearson.

DEPARTMENT OF PHYSICS				Value Added Course			
Course Type	**Course Code**	**Course Code Course Title**	**Credits**	**Total Contact Hours**	**CIA**	**Ext**	**Total**
Value Added Course		Energy harvesting	2	30			

Objectives:
1. To introduce various renewable energy sources and methods of tapping those as green energy sources.

Learning Outcome:
1. Students will be able to appreciate the need to look beyond conventional energy sources like coal and oil.
2. Student learn the methods of harvesting energy from renewable sources of energy

Unit-I: Solar radiation
Solar radiation outside the earth's atmosphere- Solar radiation at the earth's surface-Instruments for measuring radiation and sunshine-Solar radiation data-Solar radiation on tilted surfaces.

Unit-II: Solar collectors
Definitions-Methods of classification-Types of concentrating collectors-Thermal analysis of concentrating collectors-Flatplate collectors with plane reflectors.

Unit-III: Solar Pond
Principle of working-Description-Performance analysis-Transmissivity based on reflection- Refraction at the air water interfaces-Transmissivity based on absorption-Temperature distribution and collection efficiency.

Unit-IV: Direct utilization of solar energy
Photovoltaic conversion-Description and principle of working-(V-I)Characteristics- Commercial solar cell-costs-Applications.

Unit-V: Indirect utilization of solar energy
Wind energy-Classification and description of wind machines-Wave energy-Devices for wave energy conversion-Ocean thermal energy conversion

Text Book
1. Solar Energy S.P Sukhatme,J.K.Nayak,3rd Edition, Tata McGraw Hill(2009)
   Uni t I: Sections 3.1,3.2,3.3,3.7
   Unit II: Sections 6.1.2,6.1.3,6.1.4,6.1.5,6.2
   Unit III: Sections 8.2,8.3,8.4,8.4.1,8.4.2,8.4.3
   Unit IV : Sections 9.1,9.1.1,9.1.2,9.1.3,9.1.4,9.15.
   Unit V : Sections 9.2,9.2.1,9.2.2,9.4,9.4.1,9.5

Books for References
1. Non-conventional energy sources-G.DRai, Khanna publishers,Newdelhi(2001).
2. The physics of Solar cells, Jenney Nelson, Imperial college,UK (2008).

Department of Chemistry

Revised Curriculum
(Choice Based Credit system with Outcome Based Education)
Academic Year 2020-2021 onwards

The Madura College, Madurai
Department of Chemistry

Vision

To produce disciplined and committed students through effective teaching-learning for the professional growth and research aimed at a greener environment and healthier living of humankind.

Mission

- To ensure the quality and knowledgeable chemistry graduates capable of creating newdevelopments for the society and applicable in daily life to become entrepreneurs.
- Inspiring students to fulfill the expectations of local, national and global needs
- Motivate the students to pursue higher studies and research to cater the need of industries.

Programme Educational objectives

After completion of the programme, the students will be able

PEO1	To continuously update their domain knowledge for continuous professional development with focus on research and industry interaction
PEO2	To endorse multiple utility of chemistry to create innovations in providing solution for sustainable green environment
PEO3	To accomplish the ability for effective communication and to understand ethical responsibilities
PEO4	To acquire inter-social relationship and interpersonal skills in order to attain leadership qualities.
PEO5	To prefer suitable career and crack in competitive examinations

Programme Outcome (PO) (aligned with Graduate Attributes)- Bachelor of Science (B.Sc.,)

At the end of the programme the students will be able to

PO1	Integrate learned skills and knowledge derived from the study of science and other related disciplines, acquiring the necessary depth and breadth required for a transdisciplinary perspective.
PO2	Demonstrate proficiency in using disciplinary –appropriate methods for research, critical analysis or creative work and provide scientific solutions to the problem of the society.
PO3	Communicate conclusions, interpretations, and implications clearly, concisely, and effectively, both orally and in writing for different types of audiences.
PO4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and way of mitigating them.
PO5	Use modern tools, resources and software and be abreast with the emerging trends in their disciplinary area and practice life long learning.

Programme Specific Outcomes (PSO)

At the end of the programme, the students will be able to

PSO's	Statement	GraduateAttributes
PSO-1	Establish a fundamental or logical understanding of the academic field of Chemistry, its different learning areas and applications in basic chemistry like atomic structure, quantum mechanics, periodic properties, chemical bonding, hydrocarbons, different states of matter, radioactivity, nuclear chemistry, metallurgy, surface chemistry, catalysis, solutions, colloidal state, corrosion, food deterioration & adulterants, water analysis and treatment and its linkages with related disciplinary areas/subjects like Physics, Mathematics, Life sciences, Environmental sciences.	• Knowledge in core competency • Environment and Sustainability
PSO-2	Tackle problems and offer creative ideas based on analysis and critical thinking in all branches of Chemistry.	• Problem Analysis • Design and Development of solutions for complex problems
PSO- 3	Problem-solving skills that are needed to solve various kinds of chemistry-related problems with well-defined solutions and tackle complicated problems that belong to the disciplinary area limits.	• Problem Analysis • Conduct investigations of complex problems
PSO-4	Gains basic knowledge on organic synthesis, reaction mechanism, substitution, derivative formation, stereochemistry and also analytical techniques; Enable the students to understand the properties of s,p ,d and f block elements and its important compounds; to enlighten the properties and uses of inorganic complexes, organometallic compounds, co-ordination chemistry, bio-inorganic chemistry and solid state chemistry.	• Knowledge in core competency
PSO-5	Gain knowledge in the areas of kinetics, phase rule, molecular spectroscopy, thermodynamics, photochemistry, group theory, principle and applications of cell reactions and also to identify chemical formulae and solve numerical problems.	• Knowledge in core competency • Problem Analysis
PSO-6	Validates the multiple utility of chemistry in the regions of industrial chemistry, material chemistry,medicinal chemistry, green chemistry, nanochemistry and polymer chemistry; employ critical thinking and the scientific knowledge to design, carryout, record and analyze the results of chemical reactions; inculcate the scientific temperament in the students and outsidethe scientific community; Aids the students to work in pharma industry, agro-chemical industry and in various research and development (R&D) laboratories.	• Ethics • Individual and team work • Communication Project management and Finance
PSO-7	Gain practical knowledge to compare the strength and amount of the organic and inorganic substances; Through volumetric and gravimetric methods, to determine the physical properties like boiling point, melting point and also to check the purity of the samples; to handle various instruments like potentiometer and conductivity bridge.	• Modern Tool usage • Individual and team work • Communication

EVALUATION PATTERN (THEORY PAPERS)

Internal Assessment	:	**25 Marks**
External Assessment	:	**75 Marks**
Total	:	**100 Marks**

Continuous Internal Assessment   : 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case study / ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

Internal Component

Unit*	Test
Unit I and II	Test-I
Unit III and IV	Test-II
Unit-V	Assignment

- **Subject to change depends on the content**

LUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 2	Up to K 2	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	
2	CLO 3	Up to K 3	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

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BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 4	Up to K 2	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	
2	CLO 5	Up to K 3	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-	-	10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions (10 X 1 mark)	10
B- Short answer type (5 X 2 mark)	10
C- Either/Or type (5 X 5 marks)	25
D- Open Choice type (3out of 5 X 10 marks)	30
Total	**75**

EVALUATION (PRACTICAL)

Continuous Internal Assessment   : 40 Marks
External Assessment   : 60 Marks
Total   : 100 Marks

Internal Assessment   : 40 Marks

Internal Components	Marks
Internal Test	20
Observation/Record	10
Continuous class assessment	10
Total	**40**

DEPARTMENT OF CHEMISTRY
THE MADURA COLLEGE (AUTONOMOUS), MADURAI 625011
Curriculum structure for B. Sc. Chemistry to be implemented from 2020-21
(With Maths & Physics Ancillaries CMP)

Sem	Part	Course code	Title of the course	Hrs	Credits	Total Hrs/ sem	Total Credits/sem
I	I	20U1TLA1	Language I (Tamil/Hindi/Sanskrit)	6	3		
	II	20U1NEN1	English I	6	3		
	IV	20U1VEN1	Value Education and Professional Ethics	3	3		
	III	20U1MAC1	Allied Mathematics–I	6	5		
	III	20U1CMC1	General Chemistry-I	3	3		
	III	20U1CMC2	General Chemistry-II	3	3		
	III	20U2CMP1	Inorganic qualitative Analysis	3	-		
			Total No. of Hrs& Credits			**30**	**20**
II	I	20U2TLA2	Language II (Tamil/Hindi/Sanskrit)	6	3		
	II	20U2NEN2	English II	6	3		
	IV	20U2EVS1	Environment & Gender studies	3	3		
	III	20U2MAC2	Allied Mathematics–II	6	5		
	III	20U2CMC3	General Chemistry-III	3	3		
	III	20U2CMC4	General Chemistry-IV	3	3		
	III	20U2CMP1	Inorganic qualitative Analysis	3	3		
	IV		Extension Activity	-	1		
			Total No. of Hrs& Credits			**30**	**24**
III	I	20U3TLA3	Language III (Tamil/Hindi/Sanskrit)	6	3		
	II	20U3NEN3	English III	6	3		
	IV	20U3CNM1	Non major Elective I	2	2		
	IV	20U3CSB1	Skill Based Elective-I	2	2		
	III	20U3PAC1	Properties of Matter, Thermal Physics and Optics	4	4		
	III	20U4PAP2	Allied Physics Practicals	2	-		
	III	20U3CMC5	General Chemistry-V	5	5		
	III	20U4CMP2	Volumetric & Organic Analysis	3	-		
			Total No. of Hrs& Credits			**30**	**19**
IV	I	20U4TLA4	Language IV (Tamil/Hindi/Sanskrit)	6	3		
	II	20U4NEN4	English IV	6	3		
	IV	20U4CNM2	Non major Elective II	2	2		
	IV	20U4CSB2	Skill Based Elective-II	2	2		
	III	20U4PAC2	Electricity , Electronics, Atomic and Nuclear Physics	4	4		
	III	20U4PAP2	Allied Physics Practical II	2	2		
	III	20U4CMC6	General Chemistry-VI	5	5		
	III	20U4CMP2	Volumetric & Organic Analysis	3	3		
			Total No. of Hrs& Credits			**30**	**24**

V	IV	20U5CSB3	Skill Based Elective-III	2	2		
	III	20U5CMC7	Organic Chemistry-I	5	5		
	III	20U5CMC8	Inorganic Chemistry-I	5	5		
	III	20U5CMC9	Physical chemistry-I	5	5		
	III	20U5CME1	Major Elective -I	4	4		
	III	20U5CME2	Major Elective -II	3	3		
	III	20U6CMP3	Physical Chemistry Experiments	3	-		
	III	20U6CMP4	Gravimetric Estimations	3	-		
			Total No. of Hrs& Credits			**30**	**24**
VI	IV	20U6CSB4	Skill Based Elective-IV	2	2		
	III	20U6CMC10	Organic Chemistry-II	5	5		
	III	20U6CMC11	Inorganic Chemistry-II	5	5		
	III	20U6CMC12	Physical chemistry-II	5	5		
	III	20U6CME3	Major Elective -III	3	3		
	III	20U6CME4	Major Elective -IV	4	3		
	III	20U6CMP3	Physical Chemistry Experiments	3	3		
	III	20U6CMP4	Gravimetric Estimations	3	3		
						30	**29**
			Total No. of Hrs& Credits			**180**	**140**

LIST OF ELECTIVE PAPERS OFFERED IN THE DEPARTMENT OF CHEMISTRY

Major elective papers:
1. Industrial Chemistry
2. Nano & Green Chemistry
3. Biochemistry & Dyes
4. Analytical Chemistry
5. Spectroscopy and its applications
6. Pharmaceutical Chemistry
7. Solid state Chemistry
8. Materials science

Skill based elective papers:
1. Battery & Fuel cells
2. Water Analysis
3. ICT in Chemistry
4. Organic electronics
5. Clinical Bio-chemistry
6. Polymers Science
7.

Non Major Elective papers:
1. Chemistry in day-to-day life
2. Food adulteration
3. Diet management in health & Disease

Curriculum structure for B.Sc. Botany, Zoology, Microbiology and Biotechnology with Ancillary Chemistry to be implemented from 2020–21

Semester	Course	Subject Code	Course title	Contact hours/week	Credits
I	Part III: Allied –I	20U1CAC1	Allied Chemistry-I	4	4
	Allied Practical	20U2CAP1	Semi-micro qualitative & Volumetric Analysis	2	—
II	Part III : Allied–II	20U2CAC2	Allied Chemistry-II	4	4
	Allied Practical	20U2CAP1	Semi-micro qualitative & Volumetric Analysis	2	2
			Total	**12**	**10**

Curriculum structure for B.Sc. Mathematics & Physics with Ancillary Chemistry to be implemented from 2020–21

Semester	Course	Subject Code	Course title	Contact hours/week	Credits
III	Part III: Allied –I	20U3CAC1	Allied Chemistry-I	4	4
	Allied Practical	20U4CAP1	Semi-micro qualitative & Volumetric Analysis	2	—
IV	Part III : Allied–II	20U4CAC2	Allied Chemistry-II	4	4
	Allied Practical	20U4CAP1	Semi-micro qualitative & Volumetric Analysis	2	2
		Total		**12**	**10**

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry				
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Part-III-Core	20U1CMC1	General Chemistry – I	3	3	25	75	100

Course Objectives: The objective of this course is to make the student

1. To classify the organic compound based on the different functional groups and illustrate IUPAC nomenclature of organic compounds
2. To predict hybridization and geometry of organic molecule
3. To discuss the electronic effects on physical properties of organic compounds
4. To outline the basic concept on dissociation of bonds, formation and stability of intermediates
5. To categorize bonding and properties of chemical bonds based on the bonds present in it

UNIT-I: Fundamentals in Organic chemistry (9 hours)

Classification of organic compounds - IUPAC system of nomenclature of common organic compounds (upto C-10) - cycloalkanes and aromatic compounds- Naming of organic compounds with one functional group/ two functional groups/heterocyclic compounds containing one and two hetero atoms present in five/six membered rings - calculation of empirical and molecular formulae – definitions and problems - basics in isomerism-Hybridization and geometry of molecules (sp, sp^2, sp^3) (methane, ethane, ethylene and acetylene) - sigma and pi bonds – Multiple bonds and their characteristics -bond angle, bond length, bond strength of C-H and C-C bonds.

UNIT-II: Basic concepts of Organic compounds-I (9 hours)

Bond polarity of some important bonds (C-C, C-O, C-N, C=C, C-Cl, C=O, H-H, O-H, N-H and S-H bonds -dipole moment of simple organic molecules-- Van der Waal's interactions-Hydrogen bonds-Inter & Intra molecular forces in organic compounds and their effects on physical properties-Electron displacement in organic compounds - Inductive effect- Electromeric effect-Resonance- Resonance theory–Delocalization - vinylic and allylic system- Resonance effect –Hyper conjugation- steric effect - steric overcrowding - steric inhibition of resonance - steric relief (with examples).

UNIT-III: Basic concepts of Organic compounds-II (9 hours)

Dissociation of bonds - Homolysis and Heterolysis – Types of reagent-Free radicals-Carbocation, Carbanion – carbene – Nitrene – structure, geometry and stability of these intermediates-Electrophiles and Nucleophiles - Types of organic reactions - Basic ideas of nucleophilic, electrophilic addition substitution and Elimination reactions (elementary idea with examples) –Energy consideration.

UNIT-IV: Acid Base Chemistry (9 hours)

Theories of acids and bases – Arrhenius, Bronsted - Lowry theory proton donor - acceptor system. Theory of solvent system, Lewis-electron dot system and: pH of strong and weak acid solutions. Buffer solutions.Hendersonequations.Preparation of acidic and basic buffers. Relative strength of acids and bases from ka and K_b values

Non-aqueous solvents: Classification of solvents – General properties of ionizing solvents chemical reactions. Water, liquid ammonia, liquid SO_2

UNIT-V: Chemical bonding-I (9 hours)

Types of chemical bonds -Ionic bond – illustration of the formation of ionic bond (NaCl, MgO, CaF_2, Al_2O_3only)Properties of ionic compounds-factors favoring the ionic compounds- ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle – Polarizing power and Polarizability – Partial ionic character from electronegativity. Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan's rules – Covalent bond – structure and bonding of homo and heteronuclear molecules (HF, H_2O, NH_3, O_2 and N_2 only)–Hydrogen bonds in H_2O and NH_3 molecules- Vander Waals forces – ion dipole-dipole interaction- London forces.

Books for Study
1. ArunBahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, 2016.
2. R. T. Morrison, R. N. Boyd and S.K.Bhattacharjee, Organic chemistry, 7thedn, Pearson Education Asia,2010
3. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co, 2015.
4. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd., Reprint2014.

Books for Reference
1. I. L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia,2004.
2. P.L. Soni, Text book of Ionrganic Chemistry, 20thedn, Sultan chand& Sons,2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rdedn, New Delhi, ShobanLalNagin Chand & Co.,1993.

Web Resources
1. https://nptel.ac.in/courses/104106119/
2. https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring 2005/syllabus/
3. https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1

Pedagogy
1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	**Classification of Organic compounds**			
	Based on the nature of carbon skeleton and functional groups	-	1	BB
	Classification of C and H atoms of organic compounds (primary/secondary/tertiary) -	-	3	BB/PPT
	IUPAC system of nomenclature of common organic compounds	-	1	BB
	Alkanes, alkenes, alkynes, (upto C-10) cycloalkanes, and aromatic compounds.	-	4	BB/PPT
II	**Naming of Organic compounds**			
	Naming of organic compounds with one functional group	-	1	BB/PPT
	halogen compounds, alcohols, phenol, aldehydes, ketones- (Both aliphatic and aromatic)	-	2	BB
	carboxylic acids and its derivatives, cyano compounds, amines, nitro compounds-(Both aliphatic and aromatic)	-	2	BB
	Naming of compounds with two functional groups	-	2	BB
	naming of compounds with more than one carbon chain	-	1	BB
	Naming of heterocyclic compounds containing one and two hetero atoms present in five/six membered rings	-	1	BB
III	**Basic concepts in Organic compounds**			
	Hybridization and geometry - bond angle, bond length, bond strength of C-H and C-C bonds	-	1	BB/PPT/Animated Videos
	Van der Waal's interactions, Inter & Intra molecular forces and their effects on physical properties -	-	2	BB/PPT/Animated Videos
	Electronic effects - inductive effect, resonance effect - drawing of resonance structures - conditions for resonance - stability of resonance structures,	-	3	BB/PPT/Animated Videos
	hyper conjugation, electromeric effect, steric effect - steric overcrowding - steric inhibition of resonance - steric relief (with examples).	-	3	BB/PPT/Animated Videos
IV	**Bonding in Organic Molecules**			
	Dissociation of bonds - homolysis and heterolysis	-	1	BB/PPT/Animated Videos
	Radicals, carbocations, carbanions - electrophiles and nucleophiles	-	2	BB/PPT/Animated Videos
	Influence of electronic effects - dipole moment - relative strengths of acids and bases	-	3	BB/PPT/Animated Videos
	Stability of olefins - stability of radicals, carbocations and carbanions.	-	3	BB/PPT/Animated Videos
V	**Chemical bonding-I**			
	Ionic bond – Properties of ionic compounds	-	1	BB/PPT/Animated Videos
	Factors favoring the ionic compounds- ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle	-	2	BB/PPT/Animated Videos

Pauling and Mulliken's scales of electronegativity – Polarizing power and Polarizability – Partial ionic character from electronegativity.	-	2	BB/PPT/Animated Videos
Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan's rules	-	1	BB/PPT/Animated Videos
Covalent bond – structure and bonding of homo and heteronuclear molecules	-	1	BB/PPT/Animated Videos
Hydrogen bonding – Its nature, types-effect on properties– Intermolecular forces–London forces and vander Waals forces – ion dipole-dipole interaction.	-	2	BB/PPT/Animated Videos
Total Hours		45	

BB-Block board/Chalk and Talk

PPT-Power point presentation

Course Learning Outcome: After successful completion of this course, the student will be able

	CLO statement	Knowledge level
CLO1	To explain organic compounds and its classification with various functional groups	**K2**
CLO2	To apply IUPAC nomenclature concept to name organic compounds	**K3**
CLO3	To Find the hybridization and geometry of organic compounds and predict the influence of Electronic effects on the stability of the organic molecules	**K3**
CLO4	To identifythe geometry and stability of organic intermediates formed by homolytic and heterolytic cleavages	**K4**
CLO5	To apply knowledge about the common themes running through ionic covalent and hydrogen bonding	**K3**

PO and CLO Mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO 1	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**
CLO1	3	2		3	2		
CLO2	3	2		3	2		
CLO3	3	2		3	2		
CLO4	3	2		3	2		
CLO5	3	2		3	2		

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print
Mapping with Course Learning Outcomes(CLOs)

S. No.	CLOs	K- Level	Section A MCQs No. of Questions	K- Level	Section B Short Answers No. of Questions	K- Level	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K 2	2	K1 &K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
4	CLO 4	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A& B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

Name of the course Designer
1. Dr. J. Shanmugapriya
2. Dr. M. HasmathFarzana

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry				
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Part-III-Core	20U1CMC2	General Chemistry – II	3	3	25	75	100

*Course Objectives:*The objective of this course is to make the student

1. To explain the theories of various atomic models, shape of orbitals, and importance of different quantum numbers
2. To discuss the basic concepts of quantum theory and importance of operators
3. To classify the elements based on the atomic numbers in the periodic table and study the knowledge on classification of elements based on atomic number study the factors affecting properties of elements across the periodic table
4. To compare the hybridization and shapes of simple inorganic moleculesbased on VB and MO and VSEPR theories

Unit-I: Atomic Structure

Introduction to Atomic structure-Rutherford, Bohr, sommerfeld concepts and its drawbacks-Bohr's model of hydrogen atom-Atomic orbitals and shapes of s, p and d orbitals - Quantum numbers- Principal, Azimuthal, Magnetic and Spin quantum numbers and their significance - Pauli's exclusion principle – Hund's rule-Aufbau Principle, (n+1) rule- Stability of half-filled and completely filled orbitals- inert pair effect.

Unit-II: Introduction to quantum mechanics

Planck's quantum theory - Photoelectric effect, Compton effect-Wave particle duality, de Broglie equation-Davisson –Germer Experiment-Heisenberg uncertainty principle - Eigen function and Eigen value.

Unit-III: Quantum Chemistry

Wave functions and its physical properties -Normalization and Orthogonal function- The significance of the wave function ψ – interpretation of ψ^2- Postulates of Quantum mechanics - Operators-Hamiltonian, Hermitian and Laplacian -Schrodinger's time independent wave equation. (1D box)

Unit-IV: Periodic properties

Periodic properties – classification of elements as *s*, *p*, *d* and *f*-block elements – variation of atomic volume – atomic and ionic radii – ionization potential – electron affinity and electro negativity along period and groups – variation of metallic characters - Factors affecting the periodic properties. Periodic table anomalies and variations in atomic radius, ionic radius, electronic configuration, , electron affinity and electro negativity, ionization energy and metallic character of elements along the group and periods and their influences on stability, colour, coordination number, geometry, physical and chemical properties.

Unit-V: Chemical bonding-II

VSEPR Theory – Principles and hybridization- *sp, sp2, sp3 sp3d and sp3d^2*-Shapes of simple inorganic molecules ($BeCl_2$, BF_3, $SiCl_4$, PCl_5, SF_6, IF_7,H_2O, NH_3, XeF_6) – MO Theory –Bonding and anti-bonding molecular orbitals – Applications of MO theory H_2, He, N_2, O_2, HF and CO molecules – Comparison of VB and MO Theories.

Books for Study

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rdedn, New Delhi, ShobanLalNagin Chand & Co.,1993.
2. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd., Reprint2014.
3. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd.2000
4. P.L. Soni, Text book of Ionrganic Chemistry, 20thedn, Sultan chand& Sons,2000
5. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical hemistry.47thedn, Vishal Publishing Co. 2017.

Books for Reference

1. S. P. Banerjee, Advanced Inorganic Chemistry, 2ndedn,Vol- and 2, ArunabhaSen, Books and Allied (P) Ltd., Kolkata,2017.
2. G.M.Barrow, Physical Chemistry, 6thedn, McGraw-Hill Inc., US,1996.

Web Resources

1. https://www.khanacademy.org/science/chemistry/chemical-bonds#hybridization-and-hybrid-orbitals-chemistry
2. https://ocw.mit.edu/courses/chemistry/5-04-principles-of-inorganic-chemistry-ii-fall-2008/syllabus/

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	**Atomic Structure**			
	Introduction to Atomic structure-Rutherford, Bohr, sommerfeld concepts and its drawbacks-Bohr's model of hydrogen atom	-	1	BB
	Atomic orbitals and shapes of s, p and d orbitals	-	1	BB/PPT
	Quantum numbers- Principal, Azimuthal, Magnetic and Spin quantum numbers and their significance	-	2	BB
	Pauli's exclusion principle – Hund's rule- Aufbau Principle, (n+1) rule	-	2	BB/PPT
II	**Quantum Chemistry-I**			
	Planck's quantum theory - Photoelectric effect, Compton effect	-	3	BB/PPT
	Wave particle duality, de Broglie equation-	-	3	BB
	Davisson –Germer Experiment-Heisenberg uncertainty principle - Eigen function and Eigen value.	-	3	BB
III	**Quantum Chemistry-II**			
	Wave functions and its physical properties - Normalization and Orthogonal function	-	2	BB/PPT
	The significance of the wave function ψ – interpretation of ψ^2	-	3	BB/PPT
	Postulates of Quantum mechanics - Operators	-	2	BB/PPT
	Hamiltonian, Hermitian and Laplacian -Schrodinger's time independent wave equation.(1D box)	-	3	BB/PPT
IV	**Periodic properties**			
	Periodic properties – classification of elements as s, p, d and f-block elements – variation of atomic volume – atomic and ionic radii – ionization potential	-	2	BB/PPT
	Electron affinity and electro negativity along period and groups – variation of metallic characters - Factors affecting the periodic properties	-	2	BB/PPT
	Periodic table anomalies and variations in atomic radius, ionic radius, electronic configuration, , electron affinity and electro negativity, ionization energy	-	3	BB/PPT
	and metallic character of elements along the group and periods and their influences on stability, colour, coordination number, geometry, physical and chemical properties..	-	2	BB/PPT
V	**Chemical bonding-II**			
	VSEPR Theory – Principles and hybridization- sp, sp^2 and sp^3	-	2	BB/PPT/Animated Video
	Shapes of simple inorganic molecules ($BeCl_2$, BF_3, $SiCl_4$, PCl_5, SF_6, IF_7, H_2O, NH_3, XeF_6)	-	2	BB/PPT/Animated Video
	MO Theory –Bonding and anti-bonding molecular orbitals	-	2	BB/PPT/Animated Video
	Applications of MO theory H_2, He, N_2, O_2, HF and CO molecules – Comparison of VB and MO Theories.	-	3	BB/PPT/Animated Video
	Total Hours		45	

Course outcome: After successful completion of this course, the student will be able

CLOs	CLO Statement	Knowledge level
CLO1	To interpret atomic models, various quantum numbers and comparing stability of orbitals various orbitals	K2
CLO2	To organize basic concepts of quantum mechanics and the difference between classical and wave mechanics.	K3
CLO3	To apply operators to solve simple eigen values problems and approximation methods used in solving molecular energy.	K3
CLO4	To develop concept of trends in periodic properties and its variation to rationalize the nature of the bonding in substances.	K3
CLO5	To develop the structure and types of bond in inorganic molecules using VB and MO theories.	K4

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CLO1	3	2		3			
CLO2	3	2		3			
CLO3	3	2		3			
CLO4	3	2		3			
CLO5	3	2		3			

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print

Mapping with Course Learning Outcomes(CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 3	2	K1&K2	1	K2	2 (K2&K2)	1(K3)
5	CLO 5	Up to K 4	2	K1&K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

Name of the Course Designer:

1. Dr. J. Shanmugapriya

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry				
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Part-III-Core	20U2CMC3	General Chemistry – III	3	3	25	75	100

Course Objectives: The objective of this course is to make the student

1. to explain the preparation and properties of aliphatic compounds
2. to outline the importance of aliphatic hydrocarbons
3. to discuss the synthesis, reactions and stability of alicyclic compounds
4. to identify the significance of alicyclic compounds
5. to discuss the gas laws, various types of molecular velocities and explain the behavior of real gas

Unit-I: Aliphatic Compounds-I

Alkanes - preparations, physical properties, reactions, reactions with radical mechanism for substitution reaction - cracking - Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes - mechanisms involved in addition of hydrogen, halogen, hydrogen halide, hypohalous acid, water, hydroboration, hydroxylation, ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by $KMnO_4$ and polymerization.

Unit-II: Aliphatic Compounds-II

Application in the synthesis of following molecules - *cis* and *trans* 2-butene, propanal and 1-methyl cyclohexanol. Alkynes: preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH_3COOH, hydroboration - dimerisation and cyclisation - acidity of terminal alkynes.

Unit-III: Alicyclic Compounds-I

Cycloalkanes: Preparation (small, medium & large ring compounds) - reactions - cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid - Wurtz reaction- stability of cycloalkanes - Baeyer's strain theory. Cycloalkenes: Preparation and reactions of cycloalkenes.

Unit-IV: Alicyclic Compounds-II

Alicyclic compounds-Preparation of conjugate dienes - reactions - 1,2 and 1,4 addition, polymerization and Diels-Alder reaction - Application in the synthesis of following molecules: *trans* 2-chlorocyclopentanol, *trans*-2 methylcyclopentanol, *cis* and *trans* 1,2 cyclohexanediol, cyclohexene

Unit-V: Gaseous State

Ideal gas: Kinetic theory of gases - derivation of gas laws – Maxwells distribution of molecular velocities - Types of molecular velocities - Expansivity and compressibility – collision diameter – collision frequency – collision number - mean free path. Behaviour of real gas – Deviation from ideal behaviour - van der Waals' equation of state – Virial equation of state – critical constants of gas.

Books for Study

1. ArunBahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, 2016.
2. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, 2015.
3. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publishing Co, 2016.

Booksfor Reference

1. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, 4thedition, Vikas Publishing House Pvt. Ltd, 2017.
2. I.L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia, 2004.
3. Bhupinder Mehta and Manju Mehta, Organic Chemistry, 2nd edition, PHI Learning Pvt. Ltd, 2015.
4. N. Tewari, Advanced Organic Reaction Mechanism, 3rd Edition, Books &Allied (P) Ltd, 2011.
5. N. Kundu and S.K. Jain Physical Chemistry, S. Chand & Company Ltd.2000.

Web Resources

1. https://nptel.ac.in/courses/104/106/104106119/
2. https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_(Petrucci_et_al.)/26%3A_Structure_of_Organic_Compounds/26.1%3A_Organic_Compounds_and_Structures%3A_An_Overview
3. https://brilliant.org/wiki/structural-representations-of-organic-compounds/

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar/Assignment
4. Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	**Aliphatic Compounds-I**			
	Alkanes - preparations, physical properties, reactions, reactions with radical mechanism for substitution reaction – cracking	-	2	BB
	Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes	-	2	BB
	Mechanisms involved in addition of hydrogen, halogen, hydrogen halide, hypohalous acid, water, hydroboration, hydroxylation	-	3	BB/PPT
	Ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by $KMnO_4$ and polymerization	-	2	BB/PPT
II	**Aliphatic Compounds-II**			
	Application in the synthesis of following molecules - cis and trans 2-butene, propanal and 1-methyl cyclohexanol.	-	3	BB/PPT
	Alkynes: preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH_3COOH,	-	4	BB
	Hydroboration - dimerisation and Cyclisation - acidity of terminal alkynes.	-	2	BB
III	**Alicyclic Compounds-I**			
	Cycloalkanes: Preparation (small, medium & large ring compounds) - reactions - cycloaddition, dehalogenation,	-	3	BB/PPT
	pyrolysis of calcium salt of dicarboxylic acid - Wurtz reaction- stability of cycloalkanes - Baeyer's strain theory.	-	3	BB/PPT
	Cycloalkenes: Preparation and reactions of cycloalkenes.	-	3	BB/PPT
IV	**Alicyclic Compounds-II**			
	Preparation of conjugate dienes - reactions - 1,2 and 1,4 addition, polymerization and Diels-Alder reaction	-	3	BB/PPT
	Application in the synthesis of following molecules - trans 2-chlorocyclopentanol, trans-2 methylcyclopentanol,	-	3	BB/PPT
	is and trans 1,2 cyclohexanediol, yclohexene.	-	3	BB/PPT
V	**Gaseous state**			
	Ideal gas: Kinetic theory of gases - derivation of gas laws – Maxwells distribution of molecular velocities	-	2	BB/PPT
	Types of molecular velocities - Expansivity and compressibility	-	2	BB/PPT
	collision diameter – collision frequency – collision number - mean free path.	-	1	BB/PPT
	Behaviour of real gas – Deviation from ideal behaviour - Vander Waals equation of state – Virial equation of state – critical constants of gas.	-	4	BB/PPT
	Total Hours		45	

*BB-Black board/Chalk and Talk

PPT-Power point presentation

Course Learning outcomes: After successful completion of this course, the student will be able

	CLO statement	Knowledge level
CLO1	To prepare and study the properties and reactions of aliphatic compounds.	K3
CLO2	To apply aliphatic compounds for the synthesis of various molecules	K3
CLO3	To organize the knowledge on synthesis, reactions, and importance of alicyclic compounds.	K4
CLO4	To explain the behavior of gases	K2
CLO5	To solve the problems regarding molecular velocities.	K3

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO – 1	PSO - 2	PSO - 3	PSO - 4	PSO - 5	PSO - 6	PSO - 7
CLO1				3		2	2
CLO2				3		3	3
CLO3				3		3	3
CLO4	3						
CLO5	3						

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print
Mapping with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 3	2	K1& K2	1	K1	2 (K3&K3)	1(K3)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
4	CLO 4	Up to K 2	2	K1& K2	1	K2	2 (K1&K1)	1(K2)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

Name of the Course Designer
1. Dr. M. HasmathFarzana
2. Dr. J. Shanmugapriya

		DEPARTMENT OF CHEMISTRY		CLASS: I B.Sc. Chemistry				
SEM	**Course type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
II	Part-III-Core	20U2CMC4	General Chemistry – IV	3	3	25	75	100

Course Objectives: The objective of this course is to make the student

1. to explain the basic knowledge on the physical properties of liquids
2. the classify the thermotropic liquid crystals
3. to discuss the chemistry of s - block elements and its complexes
4. to design the theory behind the volumetric analysis and to develop the knowledge in the principles of concentration, primary and secondary standards
5. to outline the basic metallurgical processes and gain knowledge on the various refining methods

Unit-I: Liquid State

Liquid state: Physical properties – vapour pressure – Trouton's rule – surface tension – Effect of temperature on surface tension – capillary rise method - viscosity – effect of pressure and temperature – refraction – refractive index – specific and molar refraction. Liquid crystals: Vapour pressure temperature diagram – thermography – classification of thermotropic liquid crystals – nematic, smetic and cholesteric liquid crystals with examples.

Unit-II: s-block elements

Position of hydrogen in the periodic table, General characteristics of s – block elements – Compounds of s-block metals – oxides, hydroxides, peroxides, superoxide's-preparation and properties – oxo salts – carbonates – bicarbonates – nitrates – halides and polyhalides. Anomalous behavior of Li and Be – physical and chemical properties of Be – Uses – physical and chemical properties of Mg– Uses-biological importance of sodium and potassium.

SLT - Complexes of s-block metals - complexes with crown ethers - Organometallic compounds of Li and Be.

Unit-III: Principles of Volumetric Analysis

General principle: Types of titrations. Requirements for titrimetric analysis. Concentration systems: Molarity, molality formality, normality, wt%, ppm, milliequivalenceandmillimoles -problems. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitations of volumetric analysis, endpoint and equivalence point.Neutralisation-titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange. Metal ion indicators. Problems based on titrimetric analysis.

Unit-IV: Metallurgy-I

Occurrence of metals –basic metallurgical operations and metallurgy process – General methods involved in extraction of metals- concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process. Extraction processes– Chemical reduction – electrolytic reduction – metal displacement.

Unit-V: Metallurgy-II

Refining methods - Zone refining – van Arkel de Boer methods – electrolytic refining – ion exchange method – muffle furnace – –Extraction of the following metals: Be, Mg and Al.

Books for Study

1. R. Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publishing Co, 2016.
2. R. Puri and L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, ShobanLalNagin Chand and Co, 1990.
3. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd., Reprint, 2014.

Books for Reference

1. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd.2000.
2. G.M. Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996.
3. A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, ELBS and Longman London, 1975.
4. S.M. Khopkar, Basic Concepts of Analytical Chemistry New Age International Publisher, 2009.
5. W. U. Malik, G. D. Tuli, and R. D. Madan: Selected Topic in Inorganic Chemistry, S. Chand & Company Ltd, New Delhi, 1998.
6. P. L. Soni, Mohan Katyal, Text book of Inorganic Chemistry, 20th Edition, Sultan Chand & Sons, New Delhi,2007.

Web Resources

1. https://en.wikipedia.org/wiki/Liquid
2. https://www.britannica.com/science/metallurgy
3. https://www.coursehero.com/file/p4nk7p5/1-The-basic-principles-of-volumetric-analysis-are-given-as-below-1-The-one/
4. https://www.vedantu.com/chemistry/volumetric-analysis

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar/Assignment
4. Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	**Liquid State**			
	Liquid state: Physical properties – vapour pressure – Trouton's rule – surface tension – Effect of temperature on surface tension - capillary rise method.	-	3	BB/PPT
	Viscosity – effect of pressure and temperature – refraction – refractive index – specific and molar refraction.	-	3	BB/PPT
	Liquid crystals: Vapour pressure temperature diagram – thermography	-	1	BB
	Classification of thermotropic liquid crystals – nematic, smetic and cholesteric c liquid crystals with examples.	-	2	BB/PPT
II	**s-block elements**			
	Position of hydrogen in the periodic table, General characteristics of s – block elements	-	1	BB/PPT
	Compounds of s-block metals – oxides, hydroxides, peroxides, superoxides	-	2	BB
	Preparation and properties – oxo salts – carbonates – bicarbonates – nitrates – halides and polyhalides.	-	2	BB
	Anomalous behavior of Li and Be – physical and chemical properties of Be – Uses	-	2	BB
	Physical and chemical properties of Mg– Uses-biological importance of sodium and - potassium.	-	2	BB
III	**Principles of Volumetric Analysis**			
	General principle: Types of titrations. Requirements for titrimetric analysis.	-	1	BB/PPT
	Concentration systems: Molarity, molality formality, normality, wt%, ppm, milliequivalence and millimoles -problems.	-	2	BB/PPT
	Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, endpoint and equivalence point	-	3	BB/PPT
	Neutralisation-titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange. Metal ion indicators. Problems based on titrimetric analysis.	-	3	BB/PPT
IV	**Metallurgy-I**			
	Occurrence of metals –basic metallurgical operations and metallurgy process	-	2	BB/PPT
	General methods involved in extraction of metals- concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, alumino-thermic process.	-	4	BB/PPT
	Extraction processes– Chemical reduction – electrolytic reduction – metal displacement.	-	3	BB/PPT
V	**Metallurgy-II**			
	Refining methods - Zone refining – van Arkel de Boer methods	-	2	BB/PPT
	Electrolytic refining – ion exchange method – muffle furnace	-	3	BB/PPT
	Extraction of the following metals: Be, Mg and Al.	-	4	BB/PPT
	Total Hours		45	

*BB-Black board/Chalk and Talk

PPT-Power point presentation

Course Learning outcomes: After successful completion of this course, the student will be able

CLOs	CLO statement	Knowledge Level
CLO1	To outline the behavior of liquids and to classify types of liquid crystals	K2
CLO2	To find the applications of Be and Mg	K3
CLO3	To organize knowledge about compounds and biological importance of some s block elements	K4
CLO4	To apply the theory behind the volumetric analysis, which gives the information about the concentration, and primary & secondary standards; To solve problems based on titrimetric analysis	K3
CLO5	To describe the basics of metallurgy and the principles of extraction and refining of metals.	K3

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO - 1	PSO – 2	PSO – 3	PSO - 4	PSO - 5	PSO - 6	PSO - 7
CLO1	3					2	1
CLO2	3			3			
CLO3	2			3		1	
CLO4	1	2	1			3	3
CLO5	3			3		2	2

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print
Mapping with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
4	CLO 4	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
5	CLO 5	Up to K3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

Name of the Course Designer:
1. Dr. M. HasmathFarzana
2. Dr. S.V. Karthikeyan

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry				
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major core practical	20U2CMP1	Inorganic Qualitative Analysis	3	3	40	60	100

Course Objectives:

1. To encourage more hands-on training to undergraduate students by adding more individualized practical exercises
2. To demonstrate basic laboratory technique of qualitative analysis
3. To develop the intellectual and psychomotor skills of the students by imparting knowledge in qualitative analysis of Inorganic compounds

Inorganic Qualitative Analysis

- Qualitative analysis of a mixture containing two cations and two anions of which one will be an interfering ion.
- Semi micro methods using the conventional scheme with hydrogen sulphide will be adopted.
- *CATIONS TO BE STUDIED*: Lead, Copper, Bismuth, Cadmium, Iron, Aluminum, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.
- *ANIONS TO BE STUDIED*: Carbonate, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate, and Phosphate.

Books for Reference

1. Vogel, Text Book of Qualitative Chemical Analysis, 5th edn., ELBS/ Longman England, 1989
2. V.V. Ramanujam, Inorganic Semimicro qualitative analysis, National Publishing company, Madras, 1974
3. V. Venkateswaran , R. Veeraswamy, A.R. Kulandaivelu, Basic Principles of Practical Chemistry, S. Chand & Co., New Delhi,1997.
4. O. P. Pandey, D. N. Bajpai, S. Giri, Practical Chemistry, ISBN: 9788121908122, 9788121908122, Revised edition, S Chand & Co Ltd.

Web Resources

1. https://www.academia.edu/10186454/SEMI_MICRO_QUALITATIVE_ANALYSIS_OF_SIMPLE_INORGANIC_SALT
2. https://www.thoughtco.com/qualitative-analysis-in-chemistry-608171

Course Learning outcomes: After complete successful of this course, the student will be able

CLOs	CLO statement	Knowledge level
CLO1	To demonstrate the basic laboratory techniques of qualitative analysis of Inorganic salts containing two cations and two anions	K4
CLO2	To demonstrate mastery of basic Inorganic chemistry laboratory analysis.	K4
CLO3	To identify the interfering acid radicals, eliminate interfering anion and to perform a systematic analysis and identify the cations	K4
CLO4	To interpret analytical results	K4
CLO5	To make scientific claims that is supported by their results and other observations.	K4

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3				

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CLO1					3	3	3
CLO2					3	3	3
CLO3					3	3	3
CLO4					3	3	3
CLO5					3	3	3

3-Advance application; 2-Intermediate level;1-Basic level

Internal Component

Title of Analysis	No of hours
Inorganic qualitative analysis	90

Name of the Course Designer:
1. Dr. J.Shanmugapriya
2. Dr. S.V. Karthikeyan

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Botany, Zoology, Microbiology & Biotechnology				
SEM	Course type	Course Code	Course Title	Credit	Contact Hours/week	CIA	Ext	Total
I	Part-III Allied	20U1CAC1	Allied Chemistry – I (For I Botany& Zoology)	4	4	25	75	100

Course Objectives: The objectives of this course are to make the student

1. To explain the various atomic models and rules for writing electronic configuration
2. To discuss the types of chemical bonds, classification of organic compounds and organic reactions
3. To classify organic compound based on its functional groups
4. To predict the adsorption process and its applications
5. To examine the types of catalysis and its applications

UNIT-I: ATOMIC STRUCTURE

Introduction to structure of atom- Fundamental particles - proton, neutron and electron - Rutherford and Niels Bohr's model of an atom and their defects - Sommerfeld's modification of atomic structure, quantum numbers – Orbitals: shapes of *s*, *p* and *d* orbitals. - Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle.

UNIT-II: CHEMICAL BONDING

Types of chemical Bonds – electrovalent(ionic), covalent, co-ordinate covalent, metallic and Hydrogen bonding.Characteristics of electrovalent and covalent compounds. Valence Bond Theory - Types of overlapping (*s-s*, *s-p* and *p-p* overlapping), Sigma and pi bonds, Hybridization- sp, sp^2 and sp^3 hybridization in acetylene,ethylene&methane only.

UNIT-III: INTRODUCTION TO ORGANIC CHEMISTRY

Importance of organic compounds in daily life – Classification of organic compounds. Functional groups – definition – Various functional groups - General formula and examples for the following: Alcohols, Alkyl Halide, Carbonyl compounds (aldehyde and ketone), Carboxylic acids and Amines. Types of organic reactions – Substitution, Addition and Elimination reactions (examples only, not mechanism)

UNIT-IV: SURFACE CHEMISTRY

Definition of adsorption, occlusion, absorption, adsorbent, and adsorbate – Types of adsorption: Physisorption and chemisorption – differences between Physisorption and Chemisorption – various applications of adsorptions – Factors influencing adsorption process- nature of gases, nature of adsorbent, influence of temperature and pressure.

UNIT-V: CATALYSIS

Definition, Characteristics of catalysts - Types of catalyst (Homogeneous catalysis and heterogeneouscatalysis) – Acid and base catalysis – Enzyme catalysis with example only: positivecatalysis, negativecatalysis and auto catalysis – catalytic promoters – catalytic poison-. Intermediate compound formation theory.

Books for Study

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S.andArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. SathyaPrakash, Tuli, Basu&Madan, 1999, Advanced Inorganic Chemistry. Vol. II , 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
4. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, ShobhanLal Nagin Chand and Co., Jalandar.

Books for Reference

1. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Mukhopathyay. R and Datta. S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
4. Sharma, B. K., Industrial chemistry, Goel Publishing House, 1994

Web Resources

1. https://byjus.com/jee/atomic-structure/
2. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Atomic_Theory/Atomic_Structure
3. https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/
4. https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1,
5. https://byjus.com/jee/surface-chemistry/,   http://www.ncert.nic.in/ncerts/l/lech105.pdf
6. https://byjus.com/chemistry/catalysis/

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Lesson plan

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	**ATOMIC STRUCTURE**			
	Introduction to structure of atom- Fundamental particles - proton, neutron and electron	-	1	BB
	Rutherford and Niels Bohr's model of an atom and their defects	-	2	BB/PPT
	Sommerfeld's modification of atomic structure, quantum numbers	-	1	BB
	Orbitals: shapes of s, p and d orbitals. .	-	4	BB/PPT
	Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle		4	BB/PPT
II	**CHEMICAL BONDING**			
	Types of chemical Bonds – electrovalent(ionic), covalent	-	1	BB/PPT
	co-ordinate covalent, metallic and Hydrogen bonding	-	2	BB
	Characteristics of electrovalent and covalent compounds	-	1	BB
	Valence Bond Theory - Types of overlapping (s-s, s-p and p-p overlapping), Sigma and pi bonds	-	3	BB
	Sigma and pi bonds	-	2	BB
	Hybridization- sp, sp^2 and sp^3 hybridization in, acetylene, ethylene & methane only.	-	3	BB
III	**INTRODUCTION TO ORGANIC CHEMISTRY**			
	Importance of organic compounds in daily life – Classification of organic compounds	-	1	BB/PPT
	Functional groups – definition – various functional groups	-	2	BB/PPT
	General formula and examples for the following: Alcohols, Alkyl Halide, Carbonyl compounds (aldehyde and ketone)	-	4	BB/PPT
	Carboxylic acids and Amines. Types of organic reactions – Substitution	-	3	BB/PPT
	Addition and Elimination reactions (examples only, not mechanism)		2	BB/PPT
IV	**SURFACE CHEMISTRY**			
	Definition of adsorption, occlusion, absorption	-	2	BB/PPT
	adsorbent, and adsorbate – Types of adsorption	-	2	BB/PPT
	Physisorption and chemisorption – differences between Physisorption and Chemisorption	-	4	BB/PPT
	various applications of adsorptions – factors influencing adsorption process- nature of gases, nature of adsorbent, influence of temperature and pressure.	-	4	BB/PPT
V	**CATALYSIS**			
	Definition, Characteristics of catalysts - Types of catalyst	-	1	BB/PPT
	(Homogeneous catalysis and heterogeneous catalysis) – Acid and base catalysis	-	4	BB/PPT
	Enzyme catalysis with example only: positive catalysis, negative catalysis	-	3	BB/PPT
	auto catalysis – catalytic promoters	-	2	BB/PPT
	catalytic poison-. Intermediate compound formation theory	-	2	BB/PPT
	Total Hours		60	

*BB-Black board/Chalk and Talk

PPT-Power point presentation

Course Learning Outcomes: After successful completion of this course, the student will be able

CLOs	CLO Statement	Knowledge level
CLO1	To discuss atomic models, and occupancy of electrons on various quantum levels.	K2
CLO2	To develop the overlapping of orbitals and hybridization of simple molecules	K3
CLO3	To find the importance of organic compounds in daily life and to describe the types of organic reactions	K3
CLO4	To inspect the types of adsorption and factors affecting the process	K4
CLO5	To the characteristics of catalyst and to explicate the types of catalysis	K3

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CLO1	1						3		
CLO2	1						2		3
CLO3	1						2		3
CLO4	1								3
CLO5	1						3		2

3-Advance application;2-Intermediate level;1-Basic level

Blue Print
Mapping with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A MCQs No. of Questions	Section A MCQs K- Level	Section B Short Answers No. of Questions	Section B Short Answers K- Level	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K4	2	K1&K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	42%
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

Name of the Course Designer:
1. Dr. P. Prasanna

				CLASS: I B.Sc. Botany, Zoology, Microbiology & Biotechnology				
	DEPARTMENT OF CHEMISTRY							
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Allied	20U2CAC2	Allied Chemistry – II *(For I Botany & Zoology)*	4	4	25	75	100

Course Objectives: The objectives of this course are to make the student
1. To understand the modern concepts of acids and bases
2. To study the classification and properties of sachharides
3. To recognize about the basic ideas of amino acid and proteins
4. To learn the different types of fertilizers used for plant growth
5. To know about polymers, corrosion and its prevention

UNIT-I: ACIDS AND BASES

Modern concepts of acids and bases – Arrhenius concept, Bronsted-Lowery concept- Lewis concept – relative strength of acids- relative strength bases –concept of pH – common ion effect – applications - buffer solutions – definition - theory of buffer action and applications – Henderson's Equation - strength of solutions – normality- molarity – molality.

UNIT-II: CARBOHYDRATES

Monosaccharides: Definition – classification of carbohydrate – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – mutarotation

Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose.

Polysaccharides: Starch – Structure, properties and uses.

UNIT-III: AMINO ACIDS AND VITAMINS

Amino acids – Definition, general methods of preparation, properties and uses of Glycine and Alanine.

Proteins – Definition, classification, general properties – colour reactions (Xanthoproteic test, Ninhydrin test and Millon's test) and relationship of aminoacid with proteins.

Vitamins: Definition, classification, sources, function and deficiency of vitamins A, B-complex {(Thiamine (B1), Riboflavin (B2), Niacin (B3)} C, D, E and K (structure and synthesis not expected).

UNIT-IV: FERTILIZERS

Plant Nutrient – Macro and micro nutrients -role of various elements in plant growth-classification – natural fertilizerand chemical fertilizer – nitrogenous, phosphatic and potash fertilizers – functions of the following:

Nitrogenous fertilizers: ammonium sulphate, urea.

Phosphatic fertilizers: super phosphate of lime, triple super phosphate of lime.

Potash fertilizers: potassium sulphate, potassium chloride, potassium nitrate.

UNIT-V: INDUSTRIAL CHEMISTRY

(i) POLYMERS

Introduction: Definition of monomer and polymers – classification of polymers based on micro structures (chemical and geometrical).General methods of preparation, properties and uses of the following polymers: polyethylene, poly vinyl chloride and phenol-formaldehyde resins.

(ii) CORROSION AND PREVENTION

Definition – Types of corrosion – chemical and electrochemical corrosion– factors affecting corrosion process- nature of metal (position in galvanic series, purity of metal, relative area of corrosion, nature of surface film) - nature of environment (temperature, humidity, impurity, pH) – corrosion control - cathodic protection – sacrificial anodic protection - corrosion inhibitors.

Books for Study

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S.andArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. Sathya Prakash, Tuli, Basu& Madan, 1999, Advanced Inorganic Chemistry. Vol. II , 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
4. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, Shobhan Lal Nagin Chand and Co., Jalandar.

Books for Reference

1. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Mukhopathyay. R and Datta. S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
4. Sharma, B. K., Industrial chemistry, Goel Publishing House, 1994

Web Resources

1. https://byjus.com/jee/atomic-structure/
2. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Atomic_Theory/Atomic_Structure
3. https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/
4. https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1,
5. https://byjus.com/jee/surface-chemistry/,   http://www.ncert.nic.in/ncerts/l/lech105.pdf
6. https://byjus.com/chemistry/catalysis/

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Model

Lesson plan

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	**ACIDS AND BASES**			
	Modern concepts of acids and bases – Arrhenius concept, Bronsted-Lowery concept-	-	2	BB
	Lewis concept – Relative strength of acids- Relative strength bases-	-	3	BB/PPT
	Concept of pH – common ion effect – applications -	-	2	BB/PPT
	Buffer solutions – definition - theory of buffer action and applications – Henderson's Equation	-	3	BB/PPT
	Strength of solutions – normality- molarity – molality		2	BB/PPT
II	**CARBOHYDRATES**			
	Monosaccharides : Definition – classification of carbohydrate –	-	2	BB/PPT
	Monosaccharides – properties and uses of glucose and fructose – configuration of glucose – Mutarotation	-	3	BB/PPT
	Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose	-	3	BB/PPT
	Polysaccharides: Starch: Structure, properties and uses	-	4	BB/PPT
III	**AMINO ACIDS AND VITAMINS**			
	Amino acids – Definition, general methods of preparation, properties and uses – Glycine and Alanine.	-	2	BB/PPT
	Proteins – Definition, Classification, general properties – colour reactions (Xanthoproteic test, Ninhydrin test and Millons test) and relationship of aminoacid with proteins.	-	3	BB/PPT
	Vitamins: Definition, classification, sources, function and deficiency of vitamins A, B-complex (Thiamine (B1),	-	3	BB/PPT
	Riboflavin (B2)Niacin (B3))	-	1	BB/PPT
	C, D, E and K (structure and synthesis not expected).		3	BB/PPT
IV	**FERTILIZERS**			
	Plant Nutrient – Macro and micro nutrients -role of various elements in plant growth	-	3	BB/PPT
	Classification: natural fertilizer and chemical fertilizer – Nitrogenous, Phosphatic and Potash fertilizers -	-	2	BB/PPT
	Functions of the following: Nitrogenous fertilizers: ammonium Sulphate, urea.	-	2	BB/PPT
	Phosphatic fertilizers: super phosphate of lime, triple super phosphate of lime.	-	2	BB/PPT
	Potashfertilizers: potassium Sulphate, potassium chloride, potassium nitrate..		3	BB/PPT
V	**INDUSTRIAL CHEMISTRY**			
	Introduction: Definition of monomer and polymers - classification of polymers based on micro structures (Chemical and Geometrical).		2	BB/PPT
	General methods of preparation, properties and uses of the following polymers: polyethylene, poly vinyl chloride and phenol-formaldehyde resins.		3	BB/PPT
	Definition – Types of corrosion – chemical and electrochemical corrosion		2	BB/PPT
	Factors affecting corrosion process- nature of metal (position in galvanic series, purity of metal, relative area of corrosion, nature of surface film) - nature of environment (temperature, humidity, impurity, pH)		3	BB/PPT
	Corrosion control - cathodic protection – sacrificial anodic protection - Corrosion inhibitors		2	BB/PPT
	Total Hours		**60**	

*BB-Black board/Chalk and Talk

PPT-Power point presentation

Course Learning Outcomes: After successful completion of this course, the student will be able

CLOs	CLO Statement	Knowledge level
CLO1	To explain the applications of common ion effect and buffer action	K2
CLO2	To indicate structure of carbohydrates and figure out the configuration of glucose	K3
CLO3	To describe the preparation, properties and uses of glycine and alanine	K3
CLO4	To classify proteins, vitamins and to explain the sources, functions and deficiency of vitamins A, B, C, D, E & K and to identify the role of various elements in plant growth	K3
CLO5	To explain the types of polymers, corrosion and its control	K4

PO and CO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CLO1	1						3		
CLO2	1						2		3
CLO3	1						2		3
CLO4	1								3
CLO5	1						3		2

3-Advance application; 2-Intermediate level;1-Basic level

Units	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
5	CLO 5	Up to K 4	2	K1& K2	1	K2	2 (K3&K3)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

Name of the Course Designer:
1.Dr. M. Boominathan

	DEPARTMENT OF CHEMISTRY					CLASS: I B.Sc. Botany, Zoology, Microbiology & Biotechnology			
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I&II	Allied Chemistry practicals	20U2CAP1	Semi-micro qualitative & volumetric analysis (For I Botany& Zoology)	2	2	40	60	100

Course Objectives:

1. *To demonstrate basic laboratory technique of titration and analysis*
2. *To develop the intellectual and psychomotor skills of the students by imparting knowledge in qualitative analysis of organic compounds*
3. *To examine the quantitative estimation of inorganic compounds through volumetric techniques.*

LIST OF EXPERIMENTS

SEMI-MICRO QUALITATIVE ANALYSIS	VOLUMETRIC ANALYSIS
Semi-micro qualitative analysis of simple salts (containing one cation and one anion)	**Acidimetry** Oxalic acid VsNaOHVsHCl **Alkalimetry** Na_2CO_3VsHClVsNaOH **Permanganometry** FAS Vs $KMnO_4$Vs Oxalic acid

Books for References

1. Dr. Chirag R. Fultariya& Dr. Jalpa P. Harsor, "Volumetric analysis: Concepts and Experiments", 1st edition, ISBN No. 9781365799303.
2. Vogel's text book of macro and semi-micro qualitative inorganic analysis, 5th edition.
3. O. P. Pandey, D. N. Bajpai, S. Giri, Practical Chemistry, ISBN: 9788121908122, 9788121908122, Revised edition, S Chand & Co Ltd.

Web Resources

1. http://www.federica.unina.it/agraria/analytical-chemistry/volumetric-analysis/
2. https://byjus.com/chemistry/volumetric-analysis/

Course Learning Outcomes: After successful completion of this course, the student will be able

CLOs	CLO statement	Knowledge level
CLO1	To demonstrate the basic laboratory techniques of volumetric analysis and estimate the comparative strength of acidic, basic and redox materials present in the given samples.	K4
CLO2	To demonstrate mastery of basic semi-micro qualitative analysis of simple salts containing one anion and one cation.	K4
CLO3	To interpret analytical data and will make scientific claims that are supported by their observations.	K4
CLO4	To systematically analyze the general group cations and their individual separation of cations.	K4
CLO5	To interpret analytical data and make scientific claims that is supported by their data and other observations.	K4

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2	2	2	

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CLO1							3	2	2
CLO2							3	2	2
CLO3							3	2	2
CLO4							3	2	2
CLO5							3	2	2

3-Advance application; 2-Intermediate level; 1-Basic level

Internal Component

Title of Analysis	No of hours
Volumetric analysis	45
Semi micro qualitative analysis	45

- **Subject to change depends on the content**

Name of the Course Designer
1. Dr. J.Shanmugapriya
2. Dr.S.V.Karthikeyan

DEPARTMENT OF CHEMISTRY			*Certificate Course*				
Course Type	**Course Code**	**Course Code Course Title**	**Credits**	**Total Contact Hours**	**CIA**	**Ext**	**Total**
Certificate		Certificate course in purification and characterization of compounds	2	30	25	75	100

Course Objectives:

The objective of this certificate course is to make the student

1. To understand the concept behind the various process of purification and characterization techniques.
2. To understand the various extraction techniques.
3. To interpret the analytical data to the synthesized or new compounds using UV, IR and NMR

UNIT-I: Introduction to Separation & Purification techniques

Purification techniques of organic compounds - Distillation – fractional distillation – distillation under reduced pressure – crystallization.

UNIT-II: Chromatographic separations

Chromatography: Definition, principles-Adsorption and partition- applications of chromatography. Principle and applications of: TLC, Column and HPLC.

UNIT-III: Extraction techniques

Various process of extraction techniques – solvent extraction – extraction using soxhlet apparatus (curcumin from turmeric and piperine from black pepper).

UNIT-IV: Characterization of compounds using UV & IR

Principles and applications of UV & IR – Interpretation with pre-identified compounds using UV and IR.

UNIT-V: Characterization of compounds using NMR

Principles and applications of NMR – Interpretation of some reference molecules with 1D and 2D NMR techniques such as ^{1}H, ^{13}C, DEPT - 45, 90, 135 and COSY techniques.

Books for Study

1. R. T. Morrison, R. N. Boyd and S. K. Bhattacharjee, Organic chemistry, 7th edn, Pearson Education Asia, 2010.
2. P. S. Kalsi, Spectroscopy of Organic Compounds, 6thedn, New Age International, 2007.

Books for Reference

1. R. M. Silverstein, F. X. Webster, Spectrometric identification of Organic compounds, 6thedn, Wiley India edition, 2006.
2. Y. R. Sharma, Elementary Organic Spectroscopy, 5thedn, S. Chand & Co Pvt. Ltd., 2013.

Course outcome:

After complete successful of this course, the student will be able

(i) To apply the purification techniques for the synthesized compounds.
(ii) To interpret the analytical data for the given compounds.
(iii) To predict the structure from the given data.

Department of Botany

Revised Curriculum
(Choice Based Credit system with Outcome Based Education)
Academic Year 2020-2021 onwards

THE MADURA COLLEGE (AUTONOMOUS); MADURAI - 11
DEPARTMENT OF BOTANY
Curriculum Structure for B.Sc. Botany (Major) to be implemented from 2020-2021

SEM.	COURSE	SUBJECT CODE	COURSE TITLE	HOURS / WEEK	CREDITS
I	Part I: Language – I	20U1TLA1	Tamil - I / Sanskrit - I / Hindi – I	6	3
	Part II: English – I	20U1NEN1	English – I	6	3
	VE & PE	20U1VNE1	Value Education and Professional Ethics	3	3
	Part III: Allied – I	20U1CAC1	Paper I - Chemistry	4	4
	Allied Practical	20U2CAP1	Allied Practical	2	--
	Major Core 1	20U1BMC1	Algae, Fungi and Lichens	3	3
	Major Core 2	20U1BMC2	Bryophytes and Pteridophytes	3	3
	Major Core Practical	20U2BMP1	Major Practical – I	3	--
			Total	**30**	**19**
II	Part I: Language – II	20U2TLA2	Tamil - II / Sanskrit - II / Hindi – II	6	3
	Part II: English – II	20U2NEN2	English – II	6	3
	E & GS	20U2EVS1	Environment & Gender Studies	3	3
	Part III: Allied – I	20U2CAC2	Paper II- Chemistry	4	4
	Allied Practical	20U2CAP1	Allied Practical	2	2
	Major Core 3	20U2BMC3	Gymnosperms and Palaeobotany	3	3
	Major Core 4	20U2BMC4	Plant Anatomy and Embryology	3	3
	Major Core Practical	20U2BMP1	Major Practical – I	3	3
	Extension (AEEP)				1
			Total	**30**	**25**
III	Part I: Language – III	20U3TLA3	Tamil - III / Sanskrit - III / Hindi – III	6	3
	Part II: English – III	20U3NEN3	English – III	6	3
	Non Major Elective (NME - I)	20U3BNM1	Herbal Botany	2	2
	Skill Based Elective (SBE - I)	20U3BSM1	Horticulture/ Biofertilizer	2	2
	Part III: Allied – II	20U3ZAC1	Paper I – Zoology	4	4
	Allied Practical	20U4ZAP1	Allied Practical	2	--
	Major Core 5	20U3BMC5	Morphology and Taxonomy of Angiosperms	5	5
	Major Core Practical	20U4BMP2	Major Practical – II	3	--
			Total	**30**	**19**
IV	Part I: Language – IV	20U4TLA4	Tamil - IV / Sanskrit - IV / Hindi – IV	6	3
	Part II: English – IV	20U4NEN4	English – IV	6	3
	Non Major Elective (NME - II)	20U4BNM2	Plants and Human Welfare	2	2
	Skill Based Elective (SBE - II)	20U4BSM2	Biological Techniques/ Organic farming	2	2
	Part III: Allied – II	20U4ZAC2	Paper II- Zoology	4	4

	Allied Practical	20U4ZAP1	Allied Practical	2	2
	Major Core 6	20U4BMC6	Cell Biology and Biochemistry	5	5
	Major Core Practical	20U4BMP2	Major Practical – II	3	3
			Total	**30**	**24**
V	Skill Based Elective (SBE - III)	20U5BSM3	Mushroom Cultivation	2	2
	Major Core 7	20U5BMC7	Plant Physiology *	5	5
	Major Core 8	20U5BMC8	Genetics and Biostatistics #	5	5
	Major Core 9	20U5BMC9	Ecology and Biodiversity #	5	5
	Major Core Practical	20U6BMP3	Major Practical – III	3	--
	Major Core Practical	20U6BMP4	Major Practical – IV	3	--
	Major Elective I	20U5BME1	Molecular Biology	4	4
	Major Elective II	20U5BME2	Plant Breeding and Evolution	3	3
			Total	**30**	**24**
VI	Skill Based Elective (SBE - IV)	20U6BSM4	Environmental Impact Assessment	2	2
	Major Core 10	20U6BMC10	Microbiology and Plant Pathology *	5	5
	Major Core 11	20U6BMC11	Biotechnology #	5	5
	Major Core 12	20U6BMC12	Genomics & Bioinformatics #	5	5
	Major Core Practical	20U6BMP3	Major Practical – III	3	3
	Major Core Practical	20U6BMP4	Major Practical – IV	3	3
	Major Elective III	20U6BME3	Plant Genetic Engineering and Environmental Biotechnology	4	3
	Major Elective IV	20U6BME4	Ethnobotany & Pharmacognosy	3	3
			Total	**30**	**29**

*Major Core Practical- III
Major Core Practical- IV

Curriculum Structure for Allied Botany to be implemented from 2021-22
(Offered to II B.Sc. Zoology)

Semester	Course	Subject Code	Course Title	Hours / Week	Credits
III	Part III: Allied – II	20U3BAC1	Allied Botany – I	4	4
	Allied Practical	20U4BAP1	Allied Practical	2	--
			Total	**6**	**4**
IV	Part III: Allied – II	20U4BAC2	Allied Botany – II	4	4
	Allied Practical	20U4BAP1	Allied Practical	2	2
			Total	**6**	**6**

B.Sc., Botany

Vision

Producing Botany students as ambassadors of sustainable development in all spheres of human activity and leaving the earth to the successive generations as intact as possible.

Mission

1. To sensitize the Botany students to the classification, structure, physiology, ecology, genetics and economic importance of plants
2. To inculcate the students with an environment that fosters the development of appropriate scientific vocabulary, reasoning skills and effective oral and written communication ability for students
3. To create holistic understanding of the allied subjects through interdisciplinary learning.

Programme Outcome for B.Sc., Graduates:

At the end of the programme the graduates will be able to

PO1	Integrate learned skills and knowledge derived from the study of the science and other related disciplines, acquiring the necessary depth and breadth required for a transdisciplinary perspective.
PO2	Demonstrate proficiency in using disciplinary-appropriate methods for research, critical analysis or creative work and provide scientific solutions to the problems of the society.
PO3	Communicate conclusions, interpretations and implications clearly, concisely and effectively, both orally and in writing for different types of audience.
PO4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and ways of mitigating them.
PO5	Use modern tolls, resources and software and be abreast with the emerging trends in their disciplinary area and practice life long learning.

Programme Educational Objectives (PEOs) (aligned with Graduate Attributes)-Bachelor of Science (B.Sc.,)

The students graduating with the B.Sc., degree should be able to

PEO-1   Apply the knowledge of habitual, functional and species diversity of plants that sustain other life forms and thereby ecosystems of various kinds.

PEO-2   Able to formulate and mitigate the growing perils like habitual destruction, urban sprawling, pollution and eventually the global warming.

PEO-3   Can spread the knowledge on ecological and economic importance of plants across different age groups from varieties of community to have egalitarian social edifice.

PEO-4   Able to critically realize the role of plants in biogeochemical cycle and the human interference precluding their process.

PEO-5   Willing to utilize and protect crops and the plant resources from forest with ethical adherence.

PEO-6   Applying the knowledge on various biological interactions between plants and other life forms with life time situations.

PEO-7   Students are able to be more resilient, empathetic and harmonious.

PEO-8   Students can aim for higher studies, crack competitive examinations, gaining better placement, skillfully lead family by imparting moral values.

PEO-9   Able to up bring the yield and quality of products by adopting conventional plant breeding methods and recent biotechnological advancements.

Programme Specific Outcomes (PSOs) at the end of the programme, the students will be able to

	PSO Statement	**Graduate Attributes**
PSO-1	Identify major group of plants and compare the characteristics of lower (Algae, Bryophytes and Fungi) and higher (Pteridophytes, Gymnosperms and Angiosperms) group of plants.	a
PSO-2	To use evidence based comparative botany approach to explain the evolution of organisms and understand the genetic diversity on the earth.	a
PSO-3	To explain various plant processes and functions, metabolism, concepts of genes and genome and how organisms function at the cell, tissue and organ levels.	b
PSO-4	Understand adaptations, development and behavior of different forms of life.	a
PSO-5	Understand the networked- life on the earth and tracing the energy pyramids through nutrient flow.	b
PSO-6	Demonstrate the experimental techniques and methods of their area of specialization in Botany.	k
PSO-7	Comprehend the fundamental concepts and their applications of scientific principles are expected at the end of this course. Students will become critical thinker and acquire problem-solving capabilities.	a
PSO- 8	Strengthen their analytical, digital skills and integrate the fundamental concepts with modern tools.	b, e, i
PSO-9	Get avenues to become ecologists, biochemists, mushroom producers, molecular biologists, taxonomists, nursery managers, environmentalists, herbal product manufactures and genetics and also to sensitize students for inter and multidisciplinary research.	k

DEPARTMENT OF BOTANY				CLASS: I B.Sc. Botany				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major core-1	20U1BMC1	**Algae, Fungi and Lichens**	3	3	25	75	100

Course Objectives:
1. To acquaint the structure and reproductive characteristics of lower forms of plants.
2. To understand the classification of lower life forms of plants.
3. To analyze the economic potential of lower plant groups.

UNIT-I: Algae

General characters of algae: Occurence, thallus organizations (Unicellular, Colonial, Filamentous, Siphonaceous and Parenchymatous); Pigmentation, reserve food materials, Flagellation, Classification of algae by Fritsch up to class level. Economic importance of algae.

UNIT-II

Reproduction – Asexual – Vegetative and sporulation, Sexual reproduction (Isogamy, anisogamy and oogamy). Pattern of Lifecycles - haplontic (*Chara*), diplontic (*Sargassum*), haplodiplontic (*Ulva*), haplobiontic (*Polysiphonia*) and diplobiontic (*Gracilaria*).

UNIT-III: Fungi

General characters of fungi. Types of fungi. Nutritions in fungi. Reproduction – Asexual (vegetative and sporulation), sexual (Planogametic: Isogamy, Anisogamy and Oogamy; Aplanogametic: Gametangial contact, gametangial copulation, somatogamy). Classification of fungi by Alexopoulos (1969).

UNIT-IV

Life cycle of *Mucor* (Zygomycotina), *Peziza* (Ascomycotina) *Agaricus* (Basidiomycotina) and *Cercospora* (Deuteromycotina). Beneficial aspects of fungi- medicine, food and agriculture.

UNIT-V: Lichens

Occurrence, salient features of lichens, types: crustose, foliose and fruticose. Special vegetative structures - Soredia and Isidia. Structure and reproduction of *Usnea.* Economic importance of lichens.

Books for Study
1. Sharma, O. P. (2007). Text Book of Algae, Tata McGraw Hill Publishing Pvt. Ltd., New Delhi.
2. Vashista, Sinha B.R.& Singh, V.P.(2002). Botany for Degree students, Algae 9th revised edition, S.Chand & Company Ltd., New Delhi.
3. Hale, M. E. (1983). The Biology of Lichens, Edwad Arnold, London.
4. Pandey B. P (1989). Text Book of Botany, S. Chand Publishing Company, New Delhi,

Books for References

1. South G.R. & A. Whittick (1987). Introduction to Phycology. Blackwell Scientific Publications, Oxford.
2. Alexopolous, C.J. & C.W. Misra (1972). Introductory mycology. John Wiley and Sons, New York.
3. Chopra G.L (1972). A Text book of Fungi, S.Nagin & Co. Meerut, India
4. Dube, H. (1978). A Textbook of Fungi, Bacteria and Virus. Vikas Publishers.

Web Resources

1. https://www.easybiologyclass.com/?s=algae
2. https://www.britannica.com/search?query=fungi
3. https://www.britannica.com/science/lichen

Course Learning Outcomes:

	CLO Statement	Knowledge Level
CLO -1	Understand the morphological characteristics and identification of lower plants.	**K3**
CLO -2	Discuss the classification and its application on plant identification.	**K3**
CLO -3	Explain the patterns of lifecycle and the critical stages involved in it.	**K2**
CLO -4	Critically think about the origin and evolution of lower plants.	**K4**
CLO -5	Utilize the plant resources for the betterment of living organisms.	**K3**

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	PSO-9
CLO-1	3	2	3	2	3	3	3	3	2
CLO-2	2	2	3	3	3	2	3	3	3
CLO-3	2	3	3	2	3	3	3	3	3
CLO-4	3	3	3	3	3	3	3	2	3
CLO-5	3	3	3	2	3	2	2	3	3

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	3	2	3
CLO-2	2	1	2	1	3
CLO-3	2	2	2	1	1
CLO-4	-	3	1	-	2
CLO-5	1	3	-	3	1

3-Advance application, 2- Intermediate level, 1- Basic level

Lesson Plan:

Unit	Description		Staff Name	Hours	Mode
I	a)	General character of Algae	-	1	Black Board
	b)	Occurrence, thallus organization of algae	-	2	Group Discussion
	c)	Pigmentation, flagellation of algae	-	2	Power Point
	d)	Reproduction of algae	-	2	Black Board
	e)	Classification & ECLOnomic important of algae	-	2	Black Board
II	a)	Types of Life Cycle in algae	-	2	Power Point
	b)	Haplontic (*Chara*), diplontic (*Sargassum*	-	2	Power Point
	c)	Haplodiplontic (*Ulva*)	-	2	LMS
	d)	Haplobiontic (*Polysiphonia*)	-	2	LMS
	e)	Diplobiontic (*Gracilaria*).	-	1	Power Point
III	a)	General characters & Nutritions of fungi	-	2	Group Discussion
	b)	Asexual Reproduction of Fungi	-	3	Group Discussion
	c)	Sexual Reproduction of fungi	-	2	Group Discussion
	d)	Classification of fungi by Alexopoulous	-	2	Power Point
IV	a)	Omycetes-Life cycle of *Mucor*	-	2	Black Board
	b)	Omycetes -Life cycle of *Peziza*	-	2	Black Board
	c)	Basidiomycetes-Life cycle of *Agaricus*	-	2	Power Point
	d)	Deuteromycetes- Life cycle of *Cercospora*	-	2	Power [Point
	e)	Economic importance of fungi	-	1	LMS
V	a)	Salient features of lichens	-	2	Group Discussion
	b)	Occurrence and thallus structure of lichens	-	2	Interaction
	c)	Vegetative propagate of lichens	-	2	Virtual Lab
	d)	Structure and reproduction of lichens	-	2	Virtual Lab
	e)	Economic importance of lichens	-	1	LMS
Total				**45**	

Course Designer:
Prof. V. Meenakshi Sundaram, Assistant Professor

Blue Print – Model for External Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs No. of Questions	Section – A MCQs K – Level	Section – B Short Answer No. of Questions	Section – B Short Answer K – Level	Section C (Either/ Choice)	Section D (Open Choice)
1	CLO 1	Up to K 2	2	K1 or K2	1	K1	2(K1&K1)	1 (K2)
2	CLO 2	Up to K 3	2	K1 or K2	1	K1	2(K2&K2)	1 (K3)
3	CLO 3	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
4	CLO 4	Up to K 4	2	K1 or K2	1	K2	2(K4&K4)	1 (K4)
5	CLO 5	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
No. of Question to be asked			10		5		10	5
No. of Question to be answered			10		5		5	3
Mark for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Blue Print - Model for Internal Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)	Total
			No. of Questions	K – Level	No. of Questions	K - Level			
1	CLO 1	Up to K2	2	K1&K2	1	K1	2(K2&K2)	2 (K2/K3)	
2	CLO 2	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1 (K4)	
No. of Question to be asked			4		3		4	3	14
No. of Question to be answered			4		2		2	2	10
Mark for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		-	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-		10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

DEPARTMENT OF BOTANY				CLASS: I B.Sc. Botany				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major core-2	20U1BMC2	**Bryophytes and Pteridophytes**	3	3	25	75	100

Course Objectives:
1. To familiarize and compare the land plants with primitive forms of plants.
2. To understand the structure and reproduction of Bryophytes and Pteridophytes.
3. To evaluate economic importance of Bryophytes and Pteridophytes .

UNIT-I
Bryophytes:
Occurrence, general characters, ecology and classification by Rothmaler (1951).

UNIT-II
Structure, reproduction and life cycle of *Riccia*, *Anthoceros* and *Funaria*. economic importance of Bryophytes.

UNIT-III
Pteridophytes:
Occurrence, general characters and classification by Smith. Stelar organization. Alternation of generations. economic importance.

UNIT-IV
Structure, reproduction and life cycle of *Psilotum* and *Selaginella*.

UNIT-V
Structure, reproduction and life cycle of *Equisetum* and *Marsilea*.

Books for Study
1. Rashid, A. (2000). An Introduction to Bryophyta, Vikas Publishing House Pvt. Ltd., New Delhi.
2. Parihar, N. S. (2013). An Introduction to Embryophyta Bryophyta, 2013, Surjeet Publications, New Delhi.
3. Vashista, P.C (1971) Botany for degree students: Pteridophyta. S. Chand & Co., New Delhi
4. Pandey BP (1989). Text Book of Botany, S. Chand Publishing Company, New Delhi.

Books for References
1. Parihar, N.S (1967). An introduction to Embryophyta vol. II. Pteridophyta. Central Book Depot, Allahabad.
2. Watson, E.V (1974). The structure and life of Bryophytes. B.I. Publications, New Delhi.
3. Sporne, K.R (1976). Morphology of Pteridophytes. B.I. Publishers, New Delhi.
4. Smith, G.M. (1955). Cryptogamic Botany. Vol. III. McGraw Hill, New Delhi.

Web Resources
1. https://www.britannica.com/search?query=Bryophytes
2. https://byjus.com/biology/pteridophyta/?

Course Learning Outcomes:

		CLO Statement	Knowledge Level
CLO-1		Comprehend the vegetative and reproductive structure of primitive land plants.	**K3**
CLO-2		Understand the concepts of classification and their necessity.	**K3**
CLO-3		Explain the critical stage of plant lifecycle	**K4**
CLO-4		Compare the morphology across plant divisions.	**K3**
CLO-5		Use the knowledge for utilization and conservation aspects.	**K3**

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	PSO-9
CLO-1	3	3	3	3	3	3	2	3	2
CLO-2	3	2	2	2	3	3	2	3	2
CLO-3	3	3	2	3	3	3	3	3	3
CLO-4	2	2	2	2	2	3	3	2	3
CLO-5	2	3	2	3	2	3	3	2	3

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	1	3
CLO-2	3	1	3	2	1
CLO-3	2	-	2	-	2
CLO-4	2	3	3	3	-
CLO-5	1	2	-	2	3

3-Advance application; 2- Intermediate level; 1- Basic level

Lesson Plan:

Unit	Description	Staff Name	Hours	Mode
I	a) General characters of Bryophytes	-	3	Discussion
	b) Ecology of Bryophytes	-	3	Seminar
	c) Classification by Rothmaler	-	3	Black Board
II	a) Structure of Bryophytes	-	2	CANVAS
	b) Reproduction of Bryophytes	-	3	Power Point
	c) Life cycle of *Riccia* and *Funaria*	-	3	Power Point
	d) Economic importance	-	1	Discussion
III	a) General characters of Pteridophytes	-	2	Discussion
	b) Classification by Smith.	-	2	Black Board
	c) Stelar organization.	-	2	Power Point
	d) Alternation of generations.	-	2	Black Board
	e) Economic importance	-	1	Discussion
IV	a) Life cycle of *Psilotum*	-	5	Power Point
	b) Life cycle of *Selaginella*	-	4	Power Point
V	a) Life cycle of *Equisetum*	-	4	Power Point
	b) Life cycle of and *Marsilea*	-	5	Power Point
Total			**45**	

Course Designer: Dr. S. Gnaana Saraswathi, Assistant Professor

Blue Print – Model for External Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CLO 1	Up to K 2	2	K1 or K2	1	K1	2(K1&K1)	1 (K2)
2	CLO 2	Up to K 3	2	K1 or K2	1	K1	2(K2&K2)	1 (K3)
3	CLO 3	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
4	CLO 4	Up to K 4	2	K1 or K2	1	K2	2(K4&K4)	1 (K4)
5	CLO 5	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
No. of Question to be asked			10		5		10	5
No. of Question to be answered			10		5		5	3
Mark for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Blue Print – Model for Internal Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)	Total
			No. of Questions	K – Level	No. of Questions	K – Level			
1	CLO 1	Up to K 2	2	K1&K2	1	K1	2(K2&K2)	2 (K2/K3)	
2	CLO 2	Up to K 3	2	K1&K2	2	K2	2(K3&K3)	1 (K4)	
No. of Question to be asked			4		3		4	3	14
No. of Question to be answered			4		2		2	2	10
Mark for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		-	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-		10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

DEPARTMENT OF BOTANY				CLASS: I B.Sc. Botany				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major core – 3	20U2BMC3	**Gymnosperms and Palaeobotany**	3	3	25	75	100

Course Objectives:
1. To understand the characteristic features and classification of Gymnosperms.
2. To study the concept of fossils, geological time scale and fossilization.
3. To analyze the economic importance of Gymnosperms and fossils.

UNIT-I

Gymnosperms: General characters – Origin and Classification by Sporne (1965) – Salient features of Progymnosperms - Phylogeny and Economic importance.

UNIT-II

Salient features of Cycadales, Coniferales and Gnetales. *Cycas* – Morphology, Anatomy, Reproduction and life Cycle (Need not study developmental aspect).

UNIT-III

Auracaria – Morphology, Anatomy, Reproduction and Life cycle. *Gnetum* – Morphology, Anatomy, Reproduction and Life cycle (Need not study developmental aspect).

UNIT-IV

Palaeobotany: Concepts of palaeobotany - Geological Time scale – Determination of age of fossils, Carbon dating – Fossil types - impressions, compressions, incrustation, casts, molds, petrifications and coal balls– Role of fossil in oil exploration – Contributions of Birbal Sahni to Palaeobotany.

UNIT-V

Morphological, anatomical and geological era of following fossils: *Rhynea*, *Lepidodendron*, *Pentoxylon*, *Cordaites*.

Books for Study
1. Pandey, B.P. (1998). A Text Book of Botany Vol. II. S Chand, NewDelhi.
2. Vashista, P.C. (1978). Botany for degree students: Gymnosperms. S. Chand & Co., New Delhi.
3. Arnold, C.A. (1947). An introduction to Palaeobotany. McGraw Hill Publisher, New Delhi.

Books for References
1. Stuart WN (1998). Paleobotany and Evolution of Plants, New York Publications.
2. Johri , RM, Lata S, & Tyagi K (2005) A text book of Gymnosperms, Dominate pub and Distributer, NewDelhi.
3. Vastishta PC Sinha AK & Anikumar (2006). Gymnosperms (Revised edition), S. Chand and Company, Pvt. Ltd., New Delhi.
4. Sukla and S.P. Mishra (1982). Essentials of Palaeobotany. Vikas Publishing House.
5. Chamberlain, C.A. (1986). Gymnosperms-Structure and Evolution, Publishers & Distributors.

Web Resources:

1. https://www.britannica.com/search?query=Gymnosperms
2. https://www.easybiologyclass.com/classification-of-gymnosperms-by-sporne-short-notes/
3. https://www.britannica.com/plant/plant/Evolution-and-paleobotany
4. https://indiabiodiversity.org

Course Learning Outcomes:

		CLO Statement	Knowledge Level
CLO-1		Understand the concept of identification, classification and economic importance of Gymnosperms and fossils	K3
CLO-2		Analyze the phylogeny of Gymnosperms	K4
CLO-3		Recall the structure and life cycle of cycadales	K2
CLO-4		Critically analyze the structure and reproduction in conifers and Gnetales	K4
CLO-5		Evaluate the concepts of geological time scale and fossilization processes	K3

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	PSO-9
CLO-1	2	3	3	3	3	3	2	2	3
CLO-2	3	3	3	2	3	3	3	3	3
CLO-3	3	3	3	3	3	3	3	2	2
CLO-4	3	3	2	3	3	3	3	3	3
CLO-5	3	3	3	3	3	2	3	2	2

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	3	2	3	2
CLO-2	3	3	2	3	3
CLO-3	2	2	1	-	2
CLO-4	1	-	2	2	1
CLO-5	-	1	-	2	-

3-Advance application, 2- Intermediate level, 1- Basic level

Lesson Plan:

Unit	Description	Staff Name	Hours	Mode
I	a) General charactersof Gymnosperms	-	2	Discussion
	b) Classification by Sporne (1965)	-	2	Power Point
	c) Salient features of Progymnosperms	-	2	Seminar
	d) Phylogeny of Gymnosperms	-	2	LMS
	e) Economic importance	-	1	Discussion
II	a) Salient features of Cycadales, Coniferales and Gnetales.	-	4	LMS
	b) *Cycas* - Morphology, Anotomy	-	3	Power Point
	c) Reproduction and life Cycle of *Cycas*	-	2	Black Board
III	a) Morphology, Anatomy of *Auracaria*	-	3	Black Board
	b) Reproduction and Life cycle of *Auracaria*	-	2	Black Board
	c) *Gnetum* -Morphology, Anatomy	-	2	Black Board
	d) Reproduction and Life cycle of *Gnetum*	-	2	Black Board
IV	a) Concepts of palaeobotany	-	1	Discussion
	b) Geological Time scale	-	3	Power Point
	c) Carbon dating	-	1	LMS
	d) Types Fossil	-	2	LMS
	e) Contributions of Birbal Sahni to Palaeobotany	-	2	Discussion
V	a) Morphological, anatomical and geological era of fossil *Rhynea*	-	3	Black Board
	b) Morphological, anatomical and geological era of fossil *Lepidodendron*	-	3	Black Board
	c) Morphological, anatomical and geological era of fossil *Cordaites*	-	3	Virtual Lab
Total			**45**	

Course Designer: **Dr. S. Karuppusamy**, Assistant Professor

Blue Print – Model for External Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K - Level		
1	CLO 1	Up to K 2	2	K1 or K2	1	K1	2(K1&K1)	1 (K2)
2	CLO 2	Up to K 3	2	K1 or K2	1	K1	2(K2&K2)	1 (K3)
3	CLO 3	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
4	CLO 4	Up to K 4	2	K1 or K2	1	K2	2(K4&K4)	1 (K4)
5	CLO 5	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
No. of Question to be asked			10		5		10	5
No. of Question to be answered			10		5		5	3
Mark for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Blue Print – Model for Internal Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)	Total
			No. of Questions	K – Level	No. of Questions	K - Level			
1	CLO 1	Up to K 2	2	K1&K2	1	K1	2(K2&K2)	2 (K2/K3)	
2	CLO 2	Up to K 3	2	K1&K2	2	K2	2(K3&K3)	1 (K4)	
No. of Question to be asked			4		3		4	3	14
No. of Question to be answered			4		2		2	2	10
Mark for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		-	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-		10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

DEPARTMENT OF BOTANY				CLASS: I B.Sc. Botany				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I&II	Major core- 4	20U2BMC4	**Plant Anatomy and Embryology**	3	3	25	75	100

Course Objectives:

1. To study the structure and functions of cells and tissues.
2. To know the normal and anomalous secondary growth in Dicots and Monocots.
3. To understand the developmental processes of tissues form Spermatogenesis, Oogenesis to Embryo formation.

UNIT-I

Plant Anatomy: Meristems –classification and theories – Apical cell theory, shoot apical meristem (SAM), root organization – root apical meristem - Vascular Cambium – Types. Structure and functions of simple and complex tissues.

UNIT-II

Primary structure of Monocot stem (*Grass*) and Dicot stem (*Tridax*), Moncot root (*Zea mays*) and Dicot root (*Cicer*). Anomalous secondary growth in Dicot stem (*Achyranthes*) and Monocot stem (*Draceana*). Anatomy of Monocot leaf (Grass) and Dicot leaf (*Nerium*)

UNIT-III

Embryology of Angiosperms: Structure and development of Microsporangium, Microspores, Microgametophyte. Anther wall – tapetum – structure and functions. Structure and types of ovules. Monosporic, biosporic and tetrasporic types of embryosac and their cellular organization.

UNIT-IV

Pollination – types and agencies. Fertilization – types of pollen tube entry in to ovule. Double fertilization and Triple fusion- Endosperm –types and structure. – embryo development – Dicot (*Brassica*) and Monocot (*Drusa*).

UNIT-V

Polyembryony –Apomixis, Apospory, their role in crop improvement and seed development. Parthenocarpy. Prospects and significance of embryo and endosperm culture.

Books for Study

1. Cutler, D.F (1978). Applied plant Anatomy, Orient Longman Publishers, New Delhi
2. Agarwal, S. B (1990). Embryology of Angiosperms- a fundamental approach. Sahitya Bhawan, Agra.
3. Clowers, F. A. L (1961). Apical Meristems. Blackwell Scientific Publication, Oxford.
4. Bhojwani S. S. and Bhatnagar, S.P (2000). The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd., New Delhi.

Book for References

1. Easu, (1987). The Anatomy of seed plants. Wiley Eastern Ltd., New Delhi
2. Fahn, A. (1989). Plant Anatomy,Pergamon press, Oxford, New York.
3. Johri, B.M. (1984). Embryology and Angiosperms. Springer Verlag. Berlin
4. Maheshwari,P (2015).An Introduction to the Embryology of Angiosperms, Scholar Select Publishers.
5. Dwivedi, J. N. (1998). Embryology of Angiosperms. Rastogi and Co., Meerut.

Web Resources

1. https://www.easybiologyclass.com/plant-anatomy-online-tutorials-lecture-notes-study-materials/
2. https://www.britannica.com/science/embryo-plant

Course Learning Outcomes:

		CLO Statement	**Knowledge Level**
CLO-1		Develop and understanding of concepts and fundamentals of plant anatomy.	**K3**
CLO-2		Examine the internal anatomy of plant systems and organs.	**K3**
CLO-3		Develop critical understanding on the evolution on concepts of organizations of shoot and root apex.	**K2**
CLO-4		Analyze the composition of different parts of plants and their relationships.	**K4**
CLO-5		Critically analyze the development of male and female reproductive system and their functions.	**K3**

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**PSO-9**
CLO-1	2	3	3	2	3	3	3	2	3
CLO-2	3	3	3	3	3	3	3	3	2
CLO-3	2	3	3	3	2	3	3	2	2
CLO-4	3	3	3	3	3	3	2	2	2
CLO-5	3	3	3	3	3	3	3	3	3

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**
CLO-1	3	-	3	2	3
CLO-2	2	3	2	3	2
CLO-3	2	3	2	3	1
CLO-4	1	3	2	-	1
CLO-5	-	1	1	-	1

3-Advance application; 2- Intermediate level; 1- Basic level

Lesson Plan:

Unit		Description	Staff Name	Hours	Mode
I	a)	Classification of Meristems	-	2	LMS
	b)	Theories of Apical cell, shoot apical	-	2	Discussion
	c)	Root organization	-	1	Black Board
	d)	Types Vascular Cambium	-	2	Black Board
	e)	Structure and functions of simple & complex tissues	-	2	Power Point
II	a)	Primary structure of Monocot & Dicot stem	-	2	Power Point
	b)	Primary structure of Monocot & Dicot root	-	2	Power Point
	c)	Anomalous secondary growth in Dicot and Monocot stem	-	2	Discussion
			-	3	Power point
	d)	Anatomy of Monocot & Dicot leaf			
III	a)	Structure and development of Microsporangium, Microspores, Microgametophyte.	-	3	Black Board
	b)	Structure and functions of Anther	-	2	Power Point
	c)	Structure and types of ovules	-	2	Black Board
	d)	Structure and types of Endosperm	-	2	Black Board
IV	a)	Types of Pollination	-	2	LMS
	b)	Types of Fertilization	-	2	Power Point
	c)	Double fertilization and Triple fusion	-	2	Black Board
	d)	Embryo development – Dicot & Monocot	-	3	Power point
V	a)	Polyembryony –Apomixis, Apospory,	-	2	Black Board
	b)	Parthenocarpy	-	2	LMS
	c)	Prospects and significance of embryo	-	2	Seminar
	d)	Prospects and significance endosperm culture	-	3	Virtual Lab
		Total		**45**	

Course Designer: Dr. S. Karuppusamy, Assistant Professor

Blue Print – Model for External Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K - Level		
1	CLO 1	Up to K 2	2	K1 or K2	1	K1	2(K1&K1)	1 (K2)
2	CLO 2	Up to K 3	2	K1 or K2	1	K1	2(K2&K2)	1 (K3)
3	CLO 3	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
4	CLO 4	Up to K 4	2	K1 or K2	1	K2	2(K4&K4)	1 (K4)
5	CLO 5	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
No. of Question to be asked			10		5		10	5
No. of Question to be answered			10		5		5	3
Mark for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

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K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Blue Print – Model for Internal Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)	Total
			No. of Questions	K – Level	No. of Questions	K – Level			
1	CLO 1	Up to K 2	2	K1&K2	1	K1	2(K2&K2)	2 (K2/K3)	
2	CLO 2	Up to K 3	2	K1&K2	2	K2	2(K3&K3)	1 (K4)	
No. of Question to be asked			4		3		4	3	14
No. of Question to be answered			4		2		2	2	10
Mark for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1 - Remembering and recalling facts with specific answers

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Distribution of Section- wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		-	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-		10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

	DEPARTMENT OF BOTANY			CLASS: I B.Sc. Botany				
Sem	**Course type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
II	Major Core Practical	20U2BMP1	**Major Practical - I**	3	3	40	60	100

Course Objectives:
1. To observe morphological, anatomical and reproductive features of Algae, Fungi, Lichens and Bryophytes & Pteridophytes.
2. To train the students to prepare micro slides for observation under microscope.
3. To dissect the plant parts and tissues for experimenting the embryological and developmental study.

Algae, Fungi, Lichens Practical
1. Study of the morphology of Algae, Fungi & Lichens mentioned in the syllabus.
2. Make micro- slide preparations of aerial and reproductive parts.
3. Submission of records.
4. Field visit to study fresh water/ marine water algal forms.

Bryophytes & Pteridophytes Practical
1. Study of the morphology of Bryophytes and Pteridophytes mentioned in the syllabus.
2. Make micro- slide preparations of aerial and reproductive structures.
3. Submission of records.
4. Field visit to study different forms of bryophytes and pteridophytes for a minimum of two days.

Plant Anatomy & Embryology Practical
1. Primary structure: Transverse section of Monocot and dicot stem
2. Primary structure: Transverse section of Monocot and dicot root
3. Transverse section of dorsivetral and isobilateral layers
4. Secondary structure of dicot stem
5. Anamolous structure : T.S. of *Achyranthus*
6. T.S. of mono and di thecous anthers
7. Dissection of dicot embryo
8. Observation of slides: shoot and root meristem, ovule types, embryo sac and pollen morphology

Gymnosperms & Palaeobotany Practical
1. Observation of morphological features of plants discussed in the syllabus (*Cycas*, *Auracaria*&*Gnetum*)
2. Dissection and description of the parts of the plants in the syllabus
3. Micropreparation of slides of areal and below ground parts
4. Observation of fossil permanent slides (*Rhynia*&*Lepidodendron*)
5. Field study
6. Submission of records and field reports.

Course Learning Outcomes:

		CLO Statement	Knowledge Level
CLO-1		Analyze the morphology, anatomy and reproductive structures of Algae, Fungi and Lichens.	K4
CLO-2		Examine the morphology, anatomy and reproductive characters in bryophytes and pteridophytes.	K4
CLO-3		Demonstrate the anatomy and embryology of vascular plants.	K2
CLO-4		Identify the characteristic features of gymnosperms both living and fossil taxa.	K4
CLO-5		Acquired the knowledge on fossil and fossilization process to explore bioresources.	K3

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	PSO-9
CLO-1	3	1	2	1	3	3	3	1	3
CLO-2	3	2	2	1	2	3	2	2	2
CLO-3	-	3	3	2	3	3	3	3	2
CLO-4	3	2	2	1	2	2	3	3	2
CLO-5	-	2	-	3	1	-	2	2	2

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	3	3	3
CLO-2	3	2	3	1	2
CLO-3	2	3	1	2	3
CLO-4	2	1	2	1	2
CLO-5	-	1	-	1	1

3-Advance application; 2- Intermediate level; 1- Basic level

Lesson Plan:

Sl. No	Description	Staff Name	Hours	Mode
1	Description, Morphology and Anatomy of *Chara*	-	2	Manual sectioning
	Description, Morphology and Anatomy of *Sargassum*	-	2	Micropreparation
	Description, Morphology and Anatomy of *Ulva*	-	2	Chart
	Description, Morphology and Anatomy of *Polysiphonia*	-	2	Permanent Slide
	Description, Morphology and Anatomy of *Gracilaria*	-	2	Micropreparation
	Study the morphology and Anatomy of *Mucor*	-	2	Microscopical
	Study the morphology and Anatomy of *Peziza*	-	2	Microscopical
	Study the morphology and Anatomy of *Agaricus*	-	2	Sectioning
	Study the morphology and Anatomy of *Cercospora*	-	2	Permanent Slide
	Morphology and Anatomy of major groups of lichen	-	2	Permanent Slide
	Description and Micro- slide preparations of *Usnea*	-	2	Sectioning
	Field visit to study fresh and marine algal forms	-	2	Field Visit
2	Morphology and anatomy of *Riccia*	-	3	Images and Photos
	Morphology and Anatomy of *Funaria*	-	3	Images
	Morphology and Anatomy of *Psilotum*	-	3	Permanent Slide
	Morphology and Anatomy of *Selaginella*	-	3	Manual Sectioning
	Morphology and Anatomy of *Equisetum*	-	3	Manual Sectioning
	Morphology and Anatomy of *Marsilea*	-	3	Manual Sectioning
	Field visit to study different forms of bryophytes & pteridophytes	-	3	Field Visit
3	Primary structure Transverse section of Monocot Stem (Grass) & Root (*Zea mays*)	-	4	Manual sectioning
	Primary structure Transverse section of Dicot Stem (*Tridax*) & Root (*Cicer*)	-	4	Manual Sectioning
	Transverse section of dorsivetral and isobilateral layers (Grass &*Nerium*)	-	3	Microscopical
	Secondary structure of dicot stem (*Achyranthes*) & Monocot (*Draceana*)	-	4	Microtome
	T.S. of mono and di thecous anthers as per the syllabi	-	3	Specimen
	Dissection of dicot embryo & monocot embryo as per syllabi	-	3	Dissection
	Observation of slides: shoot and root meristem, Observation of slides: ovule types, embryo sac and pollen morphology	-	3	Permanent Slide
4	Morphological features & Anatomy of *Cycas*	-	4	Images
	Morphological features & Anatomy of *Auracaria*	-	3	Images
	Morphological features & Anatomy of plants *Gnetum*	-	3	Microtome
	Asses and Characterization of fossil sides: *Rhynia*, *Lepidodendron*&*Cordaites*	-	4	Permanent Slide
	Field study to be conducted to study various Gymnosperms	-	4	Field Visit
	Submission of field note and record note	-	3	Observation
Total			**90**	

Course Designer (s):

Dr. S. Karuppusamy, Assistant Professor**Prof. V. Meenakshisundarm**, Assistant Professor

DEPARTMENT OF BOTANY				CLASS: II B.Sc. Zoology				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Allied- I	20U3BAC1	Allied Botany - I	4	4	25	75	100

Course Objectives
1. Understand the diversity of plants and their economic importance.
2. Compare the life cycle patterns from lower to higher plants.
3. Discuss the structure and reproductive characters of different groups of plants.

Unit-I (10 Hours)
Plant Kingdom - Cryptogams and Phanerogams - salient features of Algae - Structure, reproduction and life cycle of *Caulerpa* - economic importance of Algae.

Unit-II: Fungi & Lichens(10 Hours)
General characters of Fungi - structure, reproduction and life cycle of *Puccinia* - economic importance of Fungi - Salient features of Lichens - structure and reproduction of *Usnea*.

Unit-III: Bryophytes & Pteridophytes (10 Hours)
General characters of Bryophytes - Structure, reproduction and life cycle of *Marchantia*. Salient features of Pteridophytes - Structure, reproduction and life cycle of *Lycopodium*.

Unit-IV: Gymnosperms (10 Hours)
General characters of Gymnosperms - structure, reproduction and life cycle of *Cycas* - economic importance of Gymnosperms.

Unit-V (20 Hours)
Taxonomy - Plant Nomenclature - Herbarium methods - Natural system of classification - vegetative characters, floral characters and economic importance of Rutaceae, Apocynaceae, Amaranthaceae and Poaceae.

Books for Study
1. Sharma OP(1992). Text Book of Algae, Tata McGraw Hill Publication Company Ltd., New Delhi, 1992.
2. Vashishta BR, Sinha AK & Singh VP (2011). Botany for Degree students Fungi, S. Chand Publishing Company, New Delhi.

Book for References
1. Rashid A (1999). An introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd., 1999.
2. Vashishta BR, Sinha AK & Kumar A (2011). Botany for Degree students: Gymnosperms, S. Chand Publishing Company, New Delh.
3. Lawrence GHM (1969). Taxonomy of Vascular Plants, Oxford & IBH Publishing Company Pvt. Ltd., New Delhi.
4. Sambamurty AVSS (2009). Taxonomy of Angiosperms,I.K. International Publishing House Pvt. Ltd., New Delhi, 2009.

Web Resources

1. https://www.easybiologyclass.com/?s=algae
2. https://www.britannica.com/search?query=fungi
3. https://www.britannica.com/science/lichen
4. https://indiabiodiversity.org
5. https://www.easybiologyclass.com/classification-of-gymnosperms-by-sporne-short-notes/

Course Learning Outcomes:

		CLO Statement	**Knowledge Level**
CLO-1	Analyze the plant kingdom with specific groups and their features and economic importance		**K4**
CLO-2	Apply the characters for identification of fungi and lichens		**K3**
CLO-3	Understand the general characters and life cycle of Bryophytes and Pteridiophytes		**K2**
CLO-4	Examine the characters for grouping of plant kingdom		**K2**
CLO-5	Analyze the structure and reproduction in Gymnosperms		**K4**

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**	**PSO-9**
CLO-1	-	-	1	1	-	-	-	-	-
CLO-2	-	-	-	1	-	-	-	-	-
CLO-3	-	-	2	1	-	-	-	-	-
CLO-4	-	-	1	1	-	-	-	-	-
CLO-5	-	-	1	2	-	-	-	-	-

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**
CLO-1	3	2	3	2	3
CLO-2	3	-	2	3	2
CLO-3	2	2	3	-	3
CLO-4	-	1	-	1	2
CLO-5	-	1	-	-	-

3-Advance application; 2- Intermediate level; 1- Basic level

Lesson Plan:

Unit	Description	Staff Name	Hours	Mode
I	a) Plant Kingdom - Cryptogams and Phanerogams	-	2	Black Board
	b) Salient features of Algae	-	1	Discussion
	c) Structure & reproduction of Algae	-	2	Seminar
	d) Life cycle of *Caulerpa*	-	3	Power Point
	e) Economic importance of Algae	-	2	LMS
II	a) General characters of Fungi	-	2	Power Point
	b) Structure, reproduction of *Puccinia*	-	2	Black Board
	c) Life cycle of *Puccinia*	-	2	Power Point
	d) Economic importance of Fungi	-	1	Discussion
	e) Salient features of Lichens	-	1	Black Board
	f) Structure and reproduction of *Usnea*.	-	2	Virtual Lab
III	a) General characters of Bryophytes	-	2	Interaction
	b) Structure, reproduction of *Marchantia*	-	2	Black Board
	c) Life cycle of *Marchantia*	-	2	Power Point
	d) Salient features of Pteridophytes	-	1	Seminar
	e) Structure, reproduction of *Lycopodium*	-	1	Power Point
	f) Life cycle of *Lycopodium*	-	2	LMS
IV	a) General characters of Gymnosperms	-	3	Discussion
	b) Structure, reproduction of *Cycas*	-	5	Black Board
	c) Life cycle of *Cycas*	-	3	LMS
	d) Economic importance of Gymnosperms.	-	4	Black Board
V	a) Plant Nomenclature	-	2	Interaction
	b) Herbarium methods	-	3	Virtual Lab
	c) Natural system of classification	-	3	Black Board
	d) Vegetative & Floral characters	-	3	Power Point
	e) Economic importance of Rutaceae, Apocynaceae, Amaranthaceae and Poaceae.	-	4	Discussion
Total			**60**	

Course Designer: Dr. N. Janakiraman, Assistant Professor

Blue Print – Model for External Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CLO 1	Up to K 2	2	K1 or K2	1	K1	2(K1&K1)	1 (K2)
2	CLO 2	Up to K 3	2	K1 or K2	1	K1	2(K2&K2)	1 (K3)
3	CLO 3	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
4	CLO 4	Up to K 4	2	K1 or K2	1	K2	2(K4&K4)	1 (K4)
5	CLO 5	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
No. of Question to be asked			10		5		10	5
No. of Question to be answered			10		5		5	3
Mark for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Blue Print - Model for Internal Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)	Total
			No. of Questions	K – Level	No. of Questions	K - Level			
1	CLO 1	Up to K 2	2	K1&K2	1	K1	2(K2&K2)	2 (K2/K3)	
2	CLO 2	Up to K 3	2	K1&K2	2	K2	2(K3&K3)	1 (K4)	
No. of Question to be asked			4		3		4	3	14
No. of Question to be answered			4		2		2	2	10
Mark for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		-	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-		10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

DEPARTMENT OF BOTANY				CLASS: II B.Sc. Zoology				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Allied- II	20U4BAC2	Allied Botany – II	4	4	25	75	100

Course Objectives
1. Study the various types of tissues in plants and their internal structure.
2. Identify the symptoms, causative agent and control measures of plant diseases.
3. Acquire knowledge on the functional aspects of plants.

Unit-I (12 Hours)
Plant Anatomy: Tissues - meristem and their types - Histogen theory, Tunica-Corpus theory and Korper-Kappe theory; permanent tissues - parenchyma, collenchyma, sclerenchyma, xylem and phloem.

Unit-II (10 Hours)
Internal structure of dicot Stem, monocot stem, dicot root and monocot root - Anatomy of dorsiventral and Isobilateral leaves - secondary growth in dicot stem.

Unit-III (8 Hours)
Plant Diseases: symptoms, etiology, dissemination and control measures of Tikka Disease of groundnut, Red rot of sugarcane and Citrus canker.

Unit-IV (15 Hours)
Plant Physiology: Diffusion, imbibition, osmosis, plasmolysis; absorption of water - active and passive mechanisms; ascent of sap - cohesion theory; Transpiration - types - mechanism of stomatal opening and closing - Starch-sugar hypothesis; Role of macro and micronutrients in plant growth.

Unit-V (15 Hours)
Photosynthesis: Light reaction - cyclic and non-cyclic photophosphorylation - dark reaction - C_3 and C_4 cycle; respiration: glycolysis, Kreb's cycle and electron transport system.

Books for Study
1 Pandey BP (1989). Plant Anatomy, S. Chand Publishing Company, New Delhi.
2 Singh V, Pandey PC & Jain DK (1987). Anatomy of Seed Plants, Rastogi Publications, Meerut.
3 Sharma PD (2008). Plant Pathology, Rastogi Publications, Meerut, India.

Book for References
1. Jain VK (2007). Fundamentals of Plant Physiology, S. Chand Publishing Company, New Delhi.
2. Pandey SN & Sinha BK) 2001). Plant Physiology, Third Revised Edition, Vikas Publishing House Pvt. Ltd, New Delhi.
3. Pandey, B.P. (1978). Plant Anatomy, S.Chand & Co., New Delhi,
4. Vasishta, P.C. (1982). A Text Book of Plant Anatomy, Pradeep Publications, Jullunder.
5. Alexopolous, C.J. & C.W. Misra (1972). Introductory mycology. John Wiley and Sons, New York.

Web Resources
1. https://www.easybiologyclass.com/plant-anatomy-online-tutorials-lecture-notes-study-materials/
2. https://www.britannica.com/science/photosynthesis/Basic-products-of-photosynthesis
3. https://www.britannica.com/science/plant-disease

Course Learning Outcomes:

	CLO Statement	Knowledge level
CLO-1	Able to understand the various cell and tissue types and the scientific basis behind it	**K3**
CLO-2	Report/Identify the various cell and tissue types and different group of plant species	**K3**
CLO-3	Apply the learned information to identify and control plant diseases and efficient management.	**K2**
CLO-4	Able to examine the various functions of plants to clarify the role of nutrients in plant growth and development	**K2**
CLO-5	Analyze the value of photosynthetic and the role of respiration as the sustaining life processes	**K4**

Mapping Programme Specific Outcome with Course Learning Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	PSO-9
CLO-1	-	-	2	1	-	-	-	-	-
CLO-2	-	-	1	1	-	-	-	-	-
CLO-3	-	-	1	2	-	-	-	-	-
CLO-4	-	-	1	2	-	-	-	-	-
CLO-5	-	-	1	1	-	-	-	-	-

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme Outcomes with Course Learning Outcome:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	3	3	2	3
CLO-2	3	1	1	3	3
CLO-3	2	2	1	1	2
CLO-4	1	-	2	2	2
CLO-5	1	-	1	-	1

3-Advance application; 2- Intermediate level; 1- Basic level

Lesson Plan:

Unit		Description	Staff Name	Hours	Mode
I	a)	Types of Meristem	-	3	Black Board
	b)	Theory of Histogen, Tunica-Corpus & Korper-Kappe	-	3	Power Point
	c)	Permanent tissues - Parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem.	-	6	Virtual Lab
II	a)	Internal Structure of Dicot & Monocot Stem	-	4	Discussion
	b)	Internal Structure of Dicot & Monocot Root	-	2	Black Board
	c)	Anatomy of Dorsiventral and Isobilateral	-	2	LMS
	d)	Secondary growth in dicot stem.	-	2	LMS
III	a)	Symptoms, Etiology, Dissemination and Control Measures of Tikka Disease of Groundnut	-	3	Seminar
	b)	Red Rot of Sugarcane and Citrus canker.	-	5	Power Point
IV	a)	Diffusion, Imbibition & Osmosis	-	4	Virtual Lab
	b)	Absorption of Water - Active and Passive mechanisms	-	3	LMS
	c)	Ascent of Sap - Cohesion Theory	-	3	Discussion
	d)	Types - Mechanism of Stomatal Opening and Closing - Starch-Sugar Hypothesis	-	4	Power Point
	e)	Role of macro and micronutrients in plant growth	-	1	Black Board
V	a)	Light Reaction - Cyclic and non-cyclic	-	4	Black Board
	b)	Photophosphorylation	-	2	Black Board
	c)	Dark reaction - C_3 Cycle	-	2	Power Point
	d)	C_4 cycle and Respiration	-	3	Power Point
	e)	Glycolysis, Kreb's cycle and ETS	-	4	LMS
Total				**60**	

Course Designer: Dr. N. Janakiraman, Assistant Professor

Blue Print – Model for External Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs No. of Questions	Section – A MCQs K – Level	Section – B Short Answer No. of Questions	Section – B Short Answer K – Level	Section C (Either/ Choice)	Section D (Open Choice)
1	CLO 1	Up to K 2	2	K1 or K2	1	K1	2(K1&K1)	1 (K2)
2	CLO 2	Up to K 3	2	K1 or K2	1	K1	2(K2&K2)	1 (K3)
3	CLO 3	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
4	CLO 4	Up to K 4	2	K1 or K2	1	K2	2(K4&K4)	1 (K4)
5	CLO 5	Up to K 3	2	K1 or K2	1	K2	2(K3&K3)	1 (K3)
No. of Question to be asked			10		5		10	5
No. of Question to be answered			10		5		5	3
Mark for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Blue Print – Model for Internal Examination
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K – Level	Section – A MCQs		Section – B Short Answer		Section C (Either/ Choice)	Section D (Open Choice)	Total
			No. of Questions	K – Level	No. of Questions	K - Level			
1	CLO 1	Up to K 2	2	K1&K2	1	K1	2(K2&K2)	2 (K2/K3)	
2	CLO 2	Up to K 3	2	K1&K2	2	K2	2(K3&K3)	1 (K4)	
No. of Question to be asked			4		3		4	3	14
No. of Question to be answered			4		2		2	2	10
Mark for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1 - Remembering and recalling facts with specific answers

K2- Basic understanding of fact and stating main ideas with general answers

K3- Application oriented – Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section- wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		-	4	6.67	50
K2	2	4	10	10	26	43.33	
K3	-	-	10	10	20	33.33	33
K4	-	-		10	10	16.67	17
Total Marks	4	6	20	30	60	100.00	100%

DEPARTMENT OF BOTANY				CLASS: II B.Sc. Zoology				
Sem	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III&IV	Allied Practical	20U4BAP1	Allied Practical – I	2	2	40	60	100

Course Objectives:

1. To train the students to observe the morphology and anatomy of lower plant groups.
2. To train the students to prepare micro slides of plant parts for observation under microscope.
3. To demonstrate the students to the physiological mechanisms of plants.

Allied Botany-I Practical

1. Make suitable micro preparations, identification and description of the type specimens *Caulerpa, Marchantia*, *Lycopodium* and *Cycas.*
2. Dissection and description of the locally available specimens from Rutaceae, Apocynaceae, Amaranthaceae and Poaceae.
3. Observation of *Puccinia*.
4. Submission of Records.

Allied Botany- II Practical

1. Primary structure of dicot and monocot stem.
2. Primary structure of dicot and monocot root.
3. Primary structure of dorsiventral and isobilateral leaves.
4. Determination of osmotic potential.
5. Determination of photosynthetic rate using Wilmott's bubbler.
6. Imbibitions rate of various seeds.
7. Demonstration-Bell Jar Experiment, Ganong's Potometer, Transpiration Pull Experiment, Ganong's Light Screen Experiment, Test Tube Funnel Experiment and Potato Osmoscope.
8. Spotters - Root apex, Shoot apex, Parenchyma, Sclerenchyma, Xylem, Phloem, Tikka Disease of Groundnut, Red Rot of Sugarcane and Citrus canker.
9. Submission of Record Note Book for Internal and External Evaluation.

Course Learning Outcomes:

	CLO Statement	Knowledge Level
CLO-1	Observation of morphological and anatomical features of lower plant groups.	**K2**
CLO-2	Enable to identify the flowering plants with their morphological characters.	**K4**
CLO-3	Analyze the pathological specimens and its infective agents.	**K4**
CLO-4	Examine the anatomical feature of higher plants.	**K4**
CLO-5	Knowledge on physiological mechanisms of plants system.	**K3**

Mapping Programme Specific Outcomes with Course Learning Outcome:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8	PSO-9
CLO-1	-	-	1	2	-	-	-	-	-
CLO-2	-	-	1	1	-	-	-	-	-
CLO-3	-	-	1	1	-	-	-	-	-
CLO-4	-	-	1	2	-	-	-	-	-
CLO-5	-	-	2	1	-	-	-	-	-

3-Advance application; 2- Intermediate level; 1- Basic level

Mapping Programme outcomes with Course Learning Outcome:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	3	3	2	3
CLO-2	3	1	1	3	2
CLO-3	1	2	2	1	2
CLO-4	1	-	2	1	1
CLO-5	-	-	-	-	-

3-Advance application, 2- Intermediate level, 1- Basic level

Lesson Plan:

Practical	Description	Staff Name	Hours	Mode
1	a) Make suitable micro preparations, identification and description of the type specimen: *Caulerpa*	-	3	Permanent Slide
	b) Micro preparation of different parts of *Marchantia*	-	3	Micropreparation
	c) Micro preparation of different parts of *Lycopodium*	-	3	Micropreparation
	d) Micro preparation of different parts of *Cycas*	-	3	Micropreparation
	e) Dissection and description of the locally available specimens from Rutaceae	-	4	Dissection
	f) Dissection and description of the locally available specimens from Apocynaceae	-	4	Dissection
	g) Dissection and description of Amaranthaceae	-	4	Dissection
	h) Dissection and description of Poaceae	-	3	Dissection
	i) Observation and Sectioning of *Puccinia* infected leaf	-	3	Sectioning
2	a) Primary structure of Dicot Stem & Root	-	3	Microtome
	b) Primary structure of Monocot Stem & Root	-	3	Micropreparation
	c) Primary structure of dorsiventral and isobilateral leaves	-	3	Sectioning
	d) Determination of osmotic potential	-	3	Demonstration
	e) Determination of photosynthetic rate using Wilmott's bubbler	-	3	Demonstration
	f) Study the Imbibitions rate of various seeds	-	3	Group Experiment
	g) Demonstration - Bell Jar Experiment Ganong's Potometer,	-	3	
	h) Demonstration - Transpiration Pull Experiment, Ganong's Light Screen Experiment,	-	3	Demonstration
	i) Demonstration - Test Tube Funnel Experiment and Potato Osmoscope	-	3	Demonstration
	j) Spotters - Root apex, Shoot apex, Parenchyma, Sclerenchyma, Xylem, Phloem, Tikka Disease of Groundnut, Red Rot of Sugarcane and Citrus canker	-	3	Demonstration
		-	3	Permanent Slide
Total			**60**	

Course Designer(s): Dr. P. Kannan, Assistant Professor
Dr. N. Janakiraman, Assistant Professor

EVALUATION (Theory)

Internal (Formative) : 25 Marks
External (Summative): 75 Marks
Total   : 100 Marks

Continuous Internal Assessment: 25 Marks

S. No.	Components	Marks
1.	Test (Average of two tests conducted for 40 marks and converted into 10 marks	10
2.	Assignment	05
3.	Quiz/Documentation/ Case lets/ICT based Assignment/ Mini Project	05
4.	Attendance	05
	Total	**25**

Question Paper pattern for theory external examination (Major & Allied: 75 marks)

S.No.	Section	Marks
1.	A. Multiple Choice Question (10x1)	10
2.	B. Short Answer type (5x2)	10
3.	C. Either/or Type (5x5)	25
4.	D. open Choice Type (3 out of 5questions, 3x10)	30
	Total	**75**

EVALUATION (Practical)

Internal (Formative) : 40 Marks
External (Summative): 60 Marks
Total   : 100 Marks

Question Paper pattern for external practical examination (Major & Allied: 60 marks)

S. No.	Components	Marks
1.	Major question	20
2.	Minor Question	15
3.	Spotters	20
4.	Record	05
	Total	**60**

Department of Zoology

Revised Curriculum
(Choice Based Credit system with Outcome Based Education)
Academic Year 2020-2021 onwards

THE MADURA COLLEGE (AUTONOMOUS), MADURAI-11
DEPARTMENT OF ZOOLOGY

VISION

The Department, being a centre of excellence in teaching and research in zoology, envisions fostering critical thinking and learning process, science education, highest values of life infuse ethical values, holistic development of student for their welfare and society at the central point and stride towards sustainable future.

MISSION

- ❖ To impart holistic and advanced knowledge on Zoology to enrich the students meeting the global competence through academic excellence.
- ❖ To provide specialized skills to the students to excel in their careers and also to serve society.
- ❖ To infuse ethics, values, and responsibility to the students for the conservation of fauna, there by creating sustainable environment.
- ❖ To develop an attitude among the students towards applications for the welfare of the mankind, thereby promoting Eco protection.
- ❖ To inculcate awareness on the issues on local environmental problems, job demand through field visits and discussions, online courses and web resources.

Programme Educational Objectives (PEOs): B.Sc. Zoology

After successful programme, the students will be

Sl. No.	Programme Educational Objectives
PEO1	New generation of Zoologists, capable of excelling in careers of choosing.
PEO2	Pursue post graduation or other professional education for professional development.
PEO3	Apply knowledge towards innovation and creativity in problem solving.
PEO4	Deal with the complex issues of the biodiversity in particular and biosphere at large.
PEO5	Communicate effectively and will demonstrate professional excellence while working with diverse team to exhibit leadership qualities and lifelong learning to contribute societal and environmental needs.
PEO6	Successful entrepreneur in the field of applied Zoology or other related disciplines.

PROGRAMME OUTCOMES FOR B.Sc. GRADUATES

At the end of the programme the graduates will be able to

PO1	Integrate learned skills and knowledge derived from the study of the science and other related disciplines, acquiring the necessary depth and breadth required for a transdisciplinary perspective.
PO2	Demonstrate proficiency in using disciplinary-appropriate methods for research, critical analysis or creative work and provide scientific solutions to the problems of the society.
PO3	Communicate conclusions, interpretations, and implications clearly, concisely, and effectively, both orally and in writing for different types of audiences.
PO4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and ways of mitigating them.
PO5	Use modern tools, resources and software and be abreast with the emerging trends in their disciplinary area and practice life long learning.

Programme Specific Outcomes (PSO): B.Sc. Zoology

At the end of the programme, the students will be able to

PSO	GRADUATE ATTRIBUTES	DESCRIPTION
PSO-1	Knowledge in core competency	Demonstrate a basic, systematic and coherent understanding on different learning areas and applications of Zoology like Invertebrates, Chordates, Cell biology, Biochemistry, Developmental Biology, Genetics, Animal Physiology, Evolution, Microbiology, Immunology, Biotechnology, Ecology, Biodiversity, Conservation Biology, Animal farming, Biophysics, Biostatistics, Bioinformatics, Forensic Science, Vermiculture, Applied Entomology, Medical Zoology, Ornamental fish culture, Molecular Biology, Applied Zoology and its linkages with related disciplinary areas of science such as chemistry and botany.
PSO-2	Knowledge in core competency Modern tool usage	State the animal diversity including the knowledge on unique characters, scientific classification and evolutionary relationships among major groups of animals.
PSO-3	Problem analysis	Analyze the relationships between structure and functions at different levels of biological organization (e.g., molecules, genes, genome, cells, tissues, organs, organisms, species and populations etc.). With this knowledge they can identify specific examples of the physiological adaptations, development, reproduction and behaviour of different forms of life.
PSO-4	Life-long learning Design and development of solutions for complex problems	Review the biological, chemical, and physical features of habitats (e.g., terrestrial, freshwater and marine) that animals inhabits and analyze the animal's interaction with the habitats that lead lifelong learning and contribution to sustainable environment.
PSO-5	Design and development of solutions for complex problems	Knowledge on basic and industrial importance of microbes and animals. With this knowledge they can identify specific examples for pathogens, diseases, and medical and industrial applications of Zoology.
PSO-6	Individual and team work Modern tool usage	Integrate the knowledge on Applied or Economic Zoology such as apiculture, sericulture, poultry, Animal farming, aquaculture, microbiology, biotechnology, medical lab technology, horticulture, agriculture and medicine for their career opportunities.
PSO-7	Communication	Awareness and expose on the avenues of Zoology in the society and to equip students with skills and knowledge to excel in their future careers.
PSO-8	Ethics Environment and Sustainability	Exhibit leadership qualities pertaining to societal and environmental needs, gender equity, professional ethics which cater the needs to become responsible citizens

Qualification for Admission

Candidates should have passed the Higher Secondary Examination, Zoology/Biology as one of the subject, conducted by the Board of Higher Education, Government of Tamilnadu, CBSC & ICSE or any other examination approved by Madurai Kamaraj University as equivalent.

Duration of the Course

The students shall undergo prescribed course of study for the period of three academic years under CBCS semester pattern with outcome based education.

Medium of Instruction: English.

System: Choice Based Credit System with Outcome Based Model.

EVALUATION (THEORY)

Internal (Formative)	: 25 marks
External (Summative)	: 75 marks
Total	:100 marks

Continuous Internal Assessment   : 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

BLUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K- Level	Section B Short Answers No. of Questions	Section B Short Answers K-Level	Section C (Either/or Choice)	Section D (Open Choice)	Total
1	CLO 2	Up toK2	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	
2	CLO 3	Up to K3	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K- Level			
1	CLO 4	Up to K2	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	
2	CLO 5	Up to K3	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-	-	10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions(10 X 1mark)	10
B- Short answer type (5 X 2 mark)	10
C- Either/Or type(5X 5 marks)	25
D- Open Choice type (3out of 5 X10 marks)	30
Total	**75**

EVALUATION (PRACTICAL)

Internal (Formative)	: 40 marks
External (Summative)	: 60 marks
Total	:100 marks

Question Paper Pattern for External Practical Examination (Major) :60 Marks

Components	Marks
I – Major question	20
II - Minor question	15
III-Spotters (5 x 4)	20
IV –Record book	5
Total	**60**

Question Paper Pattern for External Practical Examination (Ancillary) :60 Marks

Components	Marks
I – Major question	20
II - Minor question	15
III - Spotter (4 x 5)	20
IV – Record book	5
Total	**60**

In respect of external examinations passing minimum is 35% for Under Graduate Courses and in total, aggregate of 40%.

The curriculum is revised to suit the changing trends by propagation of ideas ensuring professional growth through innovative method of teaching. The curriculum is strengthened through the latest amendments and revisions as per UGC and TANSCHE Norms.

THE MADURA COLLEGE (AUTONOMOUS), MADURAI-11
DEPARTMENT OF ZOOLOGY
B.Sc. Zoology (with Botany and Chemistry ancillary)

Semester		Sub. Code	Subject	Hours/ Week	Credits
Semester I	Lang I	20U1T/H/SLA1	Tamil/Hindi/Sanskrit-I	6	3
	Eng I	20U1NEN1	English-I	6	3
	MCT1	20U1ZMC1	Invertebrata-I	3	3
	MCT2	20U1ZMC2	Invertebrata-II	3	3
	MCP1	20U1ZMP1	Major Practical-1	3	-
	AT1/1	20U1CAC1	Ancillary Chemistry-I	4	4
	AP1	20U1CAP1	Ancillary Chemistry Practical	2	-
	VE&PE	20U1VE&PE	Value Education & Professional Ethics	3	3
Semester II	Lang II	20U2T/H/SLA2	Tamil/Hindi/Sanskrit-II	6	3
	Eng II	20U2 NEN2	English-II	6	3
	MCT3	20U2ZMC3	Chordata-I	3	3
	MCT4	20U2ZMC4	Chordata-II	3	3
	MCP1	20U2ZMP1	Major Practical-1	3	3
	AT1/2	20U2CAC1	Ancillary Chemistry -II	4	4
	AP1	20U2CAP2	Ancillary Chemistry Practical	2	2
	E&GS	20U2E&GS	Environment & Gender Studies	3	3
	Extension (AEEP)		Extension activity	-	1
Semester III	Lan III	20U3T/H/SLA3	Tamil/Hindi/Sanskrit-III	6	3
	Eng III	20U3 NEN3	English-III	6	3
	MCT5	20U3ZMC5	Cell Biology & Biochemistry	5	5
	MCP2	20U3ZMP2	Major Practical-II	3	-
	SBE1	20U3ZSM1	Applied Entomology	2	2
	AT2/3	20U3BAC1	Ancillary Botany-I	4	4
	AP2	20U3BAP1	Ancillary Botany Practical	2	-
	NME1	20U3NM1	Non-Major Elective	2	2
Semester IV	Lan IV	20U4T/H/SLA4	Tamil/Hindi/Sanskrit-IV	6	3
	Eng IV	20U4 NEN4	English-IV	6	3
	MCT6	20U4ZMC6	Developmental Biology	5	5
	MCP2	20U4ZMP2	Major Practical-II	3	3
	SBE2	20U4ZSM2	Medical Zoology	2	2
	AT2/4	20U4 BAC2	Ancillary Botany -II	4	4
	AP2	20U4 BAP2	Ancillary Botany Practical	2	2
	NME2	20U4NM2	Non-Major Elective	2	2
Semester V	MCT7	20U5ZMC7	Genetics	5	5
	MCT8	20U5ZMC8	Animal Physiology	5	5
	MCT9	20U5ZMC9	Evolution	5	5
	MCP3	20U5ZMP3	Major Practical-III	3	-
	MCP4	20U5ZMP4	Major Practical-IV	3	-
	SBE3	20U5ZSM3	Ornamental fish culture	2	2
	MET1	20U5ZME1	Biodiversity & Conservation Biology	4	4
	MET2	20U5ZME2	Forensic Science	3	3
Semester VI	MCT10	20U6ZMC10	Microbiology & Immunology	5	5
	MCT11	20U6ZMC11	Biotechnology	5	5
	MCT12	20U6ZMC12	Ecology	5	5
	MCP3	20U6ZMP3	Major Practical-III	3	3
	MCP4	20U6ZMP4	Major Practical-IV	3	3
	SBE4	20U6ZSM4	Vermiculture	2	2
	MET3	20U6ZME3	Biophysics, Biostatistics & Bioinformatics	4	3
	MET4	20U6ZME4	Animal Farming	3	3
TOTAL				**180**	**140**

Ancillary Zoology Courses for B.Sc. Chemistry

	Sub. Code	Subject	Hrs	Credits	Int.	Ext.	Total
Semester I	20U1ZAC1	Fundamentals of Invertebrates & Chordates	4	4	25	75	100
	20U2ZAP1	Zoology Ancillary Practical	2	-	40	60	100
Semester II	20U2ZAC2	Applied Zoology	4	4	25	75	100
	20U2ZAP1	Zoology Ancillary Practical	2	2	40	60	100

Ancillary Zoology Courses for B.Sc. Botany

	Sub. Code	Subject	Hrs	Credits	Int.	Ext.	Total
Semester III	20U3ZAC1	Essentials of Invertebrates & Chordates	4	4	25	75	100
	20U4ZAP1	Zoology Ancillary Practical	2	-	40	60	100
Semester IV	20U4ZAC2	Human Physiology, Microbiology & Immunology	4	4	25	75	100
	20U4ZAP1	Zoology Ancillary Practical	2	2	40	60	100

NME Zoology Courses for B.Sc. &B.Com

	Sub. Code	Subject	Hrs	Credits	Int.	Ext.	Total
Semester III	20U3ZNM1	Essentials of Zoology	2	2	25	75	100
Semester IV	20U4ZNM2	Economic Zoology	2	2	25	75	100

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Zoology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Core	20U1ZMC1	Invertebrata – I	3	3	25	75	100

Course Objectives:
1. To understand the concept and systematic classification of animal kingdom.
2. To identify the animals from Protista to Platyhelminthes and to recognize their distinguishing features.
3. To appraise the diversity of animals in a phylogenetic context.
4. To understand how different body designs solve biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of invertebrates in biological communities, ecological interactions, and conservation problems.

Unit-I: Classification
Concept of five kingdom classification of life. Introduction to Animal kingdom – Systems of classification & nomenclature - Levels of organization - Types of symmetry.

Unit-II: Protista
Introduction to Protista, General characters & Classification (up to class) of Protista with examples.
Type study: *Paramecium*
General topics: Protozoan parasites, Life Cycle of *Plasmodium*, Locomotion & Nutrition inProtozoa.

Unit-III: Porifera
Characters & classification (up to class) of Porifera with examples.
Type study: *Leucosolenia*
General topics: Canal system in sponges.

Unit-IV: Coelenterata
Characters & classification (up to class) of Coelenterata with examples – Salient features of *Ctenophora*.
Type study: Obelia Colony
General topics: Polymorphism in Coelenterata, Diversity (Types)of corals, Structure of coral polyp & coral reefs.

Unit-V: Platyhelminthes
Characters & classification (up to class) of Platyhelminthes with examples.
Type study: Liver fluke
General topics: Parasitic adaptation in helminthic worms.

Books for Study
1. Nair N.C, Leelavathy S, Soundara Pandian N, Murugan T and Arumugam N, 2017. *A Text Book of Invertebrates,* Saras Publication, Nagercoil.
2. Nair N.C, Thangamani A, Leelavathy S, Prasanakumar S, Soundrapandian N, Murugan T, Narayanan L.M and Arumugam N, 2017. *Animal diversity (Invertebrata& Chordata)*, Saras Publication, Nagarcoil.
3. Jordan E.L and Verma P.S, 2009. *Invertebrate Zoology*, S. Chand & Co, New Delhi.
4. Kotpal R.L, 2017. *Modern text book of Zoology*: *Invertebrate*, Rastogi Publication, Meerut.

Books for References

1. Barnes R.D, 2006. *Invertebrate Zoology* (1982) VIIth Edition, Holt Saunders International Edition.
2. EkambaranathaAyyar and Ananthakrishnan T.N. (Recent Edition). *Manual of Zoology Vol–I, Part I &II,* S. Viswanathan Pvt. Ltd. Chennai.
3. Kotpal R.L, Agarwal S.K and Khetarpal, R.P, 1990. *Invertebrates,* Rastogi Publications, Meerut.
4. Anderson D.T, 2001. *Invertebrate Zoology*, Oxford University Press, New Delhi.
5. Barrington E.J.W, 1967. *Invertebrate Structure and Functions*, English Language Book Society.
6. Hyman L.H, 1940-1967. *The Invertebrates (6 vols),* McGraw-Hill Companies Inc. NY.

Web Resources

1. https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates
2. https://biologydictionary.net/invertebrate/
3. https://basicbiology.net/animal/invertebrates
4. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-121
5. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-122

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

		CLO Statement	Knowledge level
CLO-1		Understand the diversity and basic taxonomy of Animal kingdom.	K1
CLO-2		Describe the general characters and outline classification from Protista to Platyhelminthes.	K2
CLO-3		Apply the knowledge to identify the fauna based on their unique characters.	K3
CLO-4		Analyse the importance and adaptation of the fauna in their habitat.	K4
CLO-5		Examine the role of Invertebrates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
CLO-1	1	1		2			2	
CLO-2	1	3	2	3			3	
CLO-3	1	3	3	2			2	
CLO-4	1	2	3	3			3	1
CLO-5	1	2	3	3			2	

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	1			2	
CLO-2	2	2		2	
CLO-3	1	2	2	2	2
CLO-4	1	2	1	2	1
CLO-5	2	2	1	3	3

3- Advance application; 2- Intermediate level; 1- Basic level

BLUE PRINT
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	2	10	--	**17**	14.16	**42%**
K2	5	8	10	10	**33**	27.5	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN (Total hours: 45)

Unit	Description	Staff Name	Hours	Mode
I	Concept of five kingdom classification of life		2	Lecture
	Introduction to Animal kingdom		1	Interaction
	Systems of classification & nomenclature		2	Chalk and Talk
	Levels of organization		2	Group Discussion
	Types of symmetry		2	PPT
II	Introduction and General characters of Protista to Protista		1	Lecture Group Discussion
	Classification (up to class) of Protista with examples.		1	Interaction
	Type study:*Paramecium*		2	Chalk and Talk
	Protozoan parasites		1	Interaction
	Life Cycle of *Plasmodium*		2	PPT
	Locomotion & Nutrition inProtozoa		2	Interaction
III	General Characters of Porifera		2	Group Discussion
	Classification (up to class) of Porifera with examples		2	Interaction
	Type study:*Leucosolenia*		3	Chalk and Talk
	Canal system in sponges		2	PPT
IV	General Characters of Coelenterata		1	Group Discussion
	Classification (up to class) of Coelenterata with examples		1	Interaction
	Salient features of *Ctenophora*		1	Lecture
	Type study:Obelia Colony		2	Chalk and Talk
	Polymorphism in Coelenterata		1	Interaction
	Diversity (Types)of corals		1	PPT
	Structure of coral polyp & coral reefs		2	Interaction
V	General Characters ofPlatyhelminthes		1	Group Discussion
	Classification (up to class) of Platyhelminthes with examples		2	Interaction
	Type study:Liver fluke		4	Chalk and Talk
	Parasitic adaptation in helminthic worms		2	PPT

Course designers: Dr. B. Latha and Dr. C. Selvakumar

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Zoology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Core	20U1ZMC2	Invertebrata– II	3	3	25	75	100

Course Objectives:

1. To understand the taxonomy and systematic classification from Aschelminthes to Echinodermata.
2. To identify the animals from Aschelminthes to Echinodermata and to recognize their distinguishing features.
3. To appraise the diversity of animals in a phylogenetic context.
4. To understand how different body designs solve biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of invertebrates in biological communities, ecological interactions, and conservation problems.

Unit-I: Aschelminthes
Characters & classification (up to class) of Aschelminthes with examples.
Type study: *Ascaris*
General topics: Nematode parasites & their adaptations.

Unit-II: Annelida
Characters & classification (up to class) of Annelida with examples.
Type study: *Megascolex*
General topics: Coelom &coelomoducts, Metamerism in Annelida, Filter feeding in Polychaetes.

Unit-III: Arthropoda
Characters & classification (up to class) of Arthropoda with examples. Brief descriptions of *Limulus* &Sacculina,
Type study: Prawn
General topics: Mouth parts of Insects, Beneficial Insects, Salient features of Arachnids, Affinities of *Peripatus*.

Unit-IV: Mollusca
Characters & classification (up to class) of Mollusca with examples.
Type study: *Pila*
General topics: Torsion & de-torsion in Gastropods, Cephalopods as an advanced Mollusc,Economically important Mollusca.

Unit-V: Echinodermata
Characters & classification (up to class) of Echinodermata with examples.
Type study: Starfish
General topics: Echinoderm larva.

Books for Study

1. Nair N.C, Leelavathy S, Soundara Pandian N, Murugan T and Arumugam N, 2017. *A Text Book ofInvertebrates,* Saras Publication, Nagercoil.
2. Nair N.C, Thangamani A, Leelavathy S, Prasanakumar S, Soundrapandian N, Murugan T, Narayanan L.M and Arumugam N, 2017. *Animal diversity (Invertebrata& Chordata)*, Saras Publication, Nagarcoil.
3. Jordan E.L and Verma P.S, 2009. *Invertebrate Zoology*, S. Chand & Co, New Delhi.
4. Kotpal R.L, 2017. *Modern text book of Zoology*: *Invertebrate*, Rastogi Publication, Meerut.

Books for References

1. Barnes R.D, 2006. *Invertebrate Zoology*VIIth Edition, Holt Saunders International Edition.
2. EkambaranathaAyyar and Ananthakrishnan T.N. 1982. *Manual of Zoology Vol–I, Part I &II,* S. Viswanathan Pvt. Ltd. Chennai.
3. Kotpal R.L, Agarwal S.K and Khetarpal R.P, 1990. *Invertebrates,* Rastogi Publications, Meerut.
4. Anderson D.T, 2001. *Invertebrate Zoology*, Oxford University Press, New Delhi.
5. Barrington E.J.W,1967. *Invertebrate Structure and Functions*, English Language Book Society.

Web Resources

1. https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates
2. https://biologydictionary.net/invertebrate/
3. https://basicbiology.net/animal/invertebrates
4. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-121
5. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-122

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

	CLO Statement	Knowledge level
CLO-1	Understand the diversity and basic taxonomy from Aschelminthes to Echinodermata.	K1
CLO-2	Recall the general characters and outline classification from Aschelminthes to Echinodermata.	K2
CLO-3	Apply the knowledge to identify the fauna based on their unique characters.	K3
CLO-4	Analyse the importance and adaptation of the fauna in their habitat.	K4
CLO-5	Evaluate the role of Invertebrates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes:

	PSO-1	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**
CLO-1	1	3		2			1	
CLO-2	1	3	2	2			2	
CLO-3	1	3	3	3			2	
CLO-4	1	2	3	3			2	1
CLO-5	1	2	3	2			2	

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**
CLO-1	1				
CLO-2	2	2	1	2	
CLO-3	2	2	1	2	1
CLO-4	2	2	2	2	
CLO-5	2	2	2	2	3

3- Advance application; 2- Intermediate level; 1- Basic level

BLUE PRINT
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	2	10	--	**17**	14.16	**42%**
K2	5	8	10	10	**33**	27.5	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN (Total hours: 45)

Unit	Description	Staff Name	Hours	Mode
I	Characters of Aschelminthes		1	Group Discussion
	Classification (up to class) of Aschelminthes with examples		2	Interaction
	Type study:*Ascaris*		4	Chalk and Talk
	Nematode parasites & their adaptations.		2	Lecture
II	Characters of Annelida		1	Group Discussion
	Classification (up to class) of Annelida with examples		1	Interaction
	Type study:*Megascolex*		4	Chalk and Talk
	Coelom &coelomoducts		1	Interaction
	Metamerism in Annelida		1	PPT
	Filter feeding in Polychaetes		1	Interaction
III	Characters of Arthropoda.		1	Group Discussion
	Classification (up to class) of Arthropoda with examples.		1	Interaction
	Brief descriptions of *Limulus* &Sacculina		1	Lecture
	Type study:Prawn		3	Chalk and Talk Interaction
	Mouth parts of Insects, Beneficial Insects		2	PPT, Group Discussion
	Salient features of Arachnids, Affinities of *Peripatus*		1	Lecture, Interaction
IV	Characters of Mollusca		1	Group Discussion
	Classification (up to class) of Mollusca with examples		1	Interaction
	Type study:*Pila*		4	Chalk and Talk
	Torsion & de-torison in Gastropods		1	Lecture
	Cephalopods as an advanced Mollusc		1	PPT
	Economically important Mollusca		1	Interaction
V	Characters of Echinodermata		1	Group Discussion
	Classification (up to class) of Echinodermata with examples.		2	Interaction
	Type study:Starfish		4	Chalk and Talk
	Echinoderm larva		2	Lecture

Course designers: Dr. R. Eswaran and Dr. L.D. Devasree

Semester I: Mapping of Courses with Programme Specific Outcomes

Mapping with Programme Specific Outcomes:

Course	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
Invertebrata-1	1	2	3	2			3	
Invertebrata-2	1	2	3	2			3	
Major Practical-1	2	3	3				2	
Value Education & Professional Ethics	2						1	3

3- Advance application; 2- Intermediate level; 1- Basic level

Semester I: Mapping of CourseLearning Outcomes with Programme Specific Outcomes:

Course		PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
Invertebrata-I	CLO-1	1	1		2			2	
	CLO-2	1	3	2	3			3	
	CLO-3	1	3	3	2			2	
	CLO-4	1	2	3	3			3	1
	CLO-5	1	2	3	3			2	
Invertebrata-II	CLO-1	1	3		2			1	
	CLO-2	1	3	2	2			2	
	CLO-3	1	3	3	3			2	
	CLO-4	1	2	3	3			2	1
	CLO-5	1	2	3	2			2	

3- Advance application; 2- Intermediate level; 1- Basic level

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Zoology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Core	20U2ZMC3	Chordata - I	3	3	25	75	100

Course Objectives:
1. To understand the basic and systematic classification of Chordates.
2. To identify the Prochordate to Pisces animals and recognize their distinguishing features.
3. To appraise the affinities of animals in a phylogenetic context.
4. To understand how different body designs solve biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of vertebrates in biological communities and ecological interactions.

Unit-I: Introduction, Prochordata - Urochordates
General characters and classification of Chordata (up to class) with examples.
General characters and classification of Urochordates (up to class) with examples.
Type Study: Ascidian
General topics: Retrogressive metamorphosis in Ascidia.

Unit-II: Prochordata - Cephalochordates
General characters and classification of Cephalochordates (up to class) with examples.
Type Study: *Amphioxus*
General topics: Affinities of *Amphioxus*.

Unit-III: Prochordata - Hemichordates
General characters and classification of Hemichordates (up to class) with examples.
Type Study: *Balanoglossus*
General topics: Affinities of Hemichordates.

Unit-IV: Agnatha
General characters and classification of Agnatha (up to class) with examples.
Type Study: *Petromyzon*
General topics: Salient features of Cyclostomata&Ostracoderm.

Unit-V: Pisces
General characters and classification of Pisces (up to order with examples) with examples.
Type Study: *Scoliodon*
General topics: Accessory respiratory organs in fishes, Types of Fins and function, Migration of Fishes.

Books for Study
1. Thangamani A, Prasannakumar S, Narayanan L.M, Arumugam N, 2017. *A Text Book ofChordates,* SarasPublication, Nagercoil.
2. Kotpal R.L, 2017. *Mordern Text Book of Zoology*: *Vertebrates*, Rastogi Publications, Meerut.
3. Arumugam N, 2019. *Animal Diversity – Chordata*, *Volume - 2*, Saras Publication, Nagercoil.

Books for References

1. EkambaranathaAyyar and Ananthakrishnan T.N. (Recent Edition), *Manual of Zoology Vol–II*, S. Viswanathan Pvt. Ltd. Chennai.
2. Young J.Z, 1950. *Life of Vertebrates,* Clarendon Press, Oxford, UK.
3. Pough Harvey F, Christine M, Janis and John B, Heiser, 2002. *Vertebrate Life*, Pearson Education Inc. New Delhi.
4. Verma P.S, 2010. *Chordate Zoology*, S Chand Publishers, New Delhi.

Web Resources

1. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-123
2. https://ucmp.berkeley.edu/vertebrates/vertintro.html
3. https://ucmp.berkeley.edu/chordata/chordata.html

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

		CLO Statement	Knowledge level
CLO-1		Understand the diversity and basic taxonomy from Prochordate to Pisces.	K1
CLO-2		Describe the general characters and outline classification from Prochordate to Pisces.	K2
CLO-3		Apply the knowledge to identify the fauna based on their unique characters.	K3
CLO-4		Analyse the importance and adaptation of fauna in their habitat.	K4
CLO-5		Examine the role of Chordates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
CLO-1	1	2	2	2			1	
CLO-2	1	3	3	3			2	
CLO-3	1	3	3	3			3	
CLO-4	1	2	3	3			3	
CLO-5	1	2	2	2			3	

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	1	2	
CLO-2	2	2	2	2	1
CLO-3	2	2	2	2	1
CLO-4	2	2	2	2	3
CLO-5	2	2	2	2	3

3- Advance application; 2- Intermediate level; 1- Basic level

BLUE PRINT
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K4)
5	CLO 5	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN (Total hours: 45)

Unit	Description	Staff Name	Hours	Mode
I	General characters of Chordata		1	Group Discussion
	Classification of Chordata (up to class) with examples		1	Interaction
	General characters of Urochordates		1	Group Discussion
	Classification of Urochordates (up to class) with examples		1	Interaction
	Type Study:Ascidian		4	Chalk and Talk
	Retrogressive metamorphosis in Ascidia		1	Lecture
II	General characters of Cephalochordates		1	Group Discussion
	Classification of Cephalochordates (up to class) with examples		1	Interaction
	Type Study:*Amphioxus*		5	Chalk and Talk
	Affinities of *Amphioxus*		2	Lecture
III	General characters of Hemichordates		1	Group Discussion
	Classification of Hemichordates (up to class) with examples.		1	Interaction
	Type Study:*Balanoglossus*		5	Chalk and Talk
	Affinities of Hemichordates		2	PPT
IV	General characters of Agnatha		1	Group Discussion
	Classification of Agnatha (up to class) with examples		1	Interaction
	Type Study:*Petromyzon*		5	Chalk and Talk
	Salient features of Cyclostomata		1	Lecture
	Salient features of Ostracoderm		1	PPT
V	General characters of Pisces		1	Group Discussion
	Classification of Pisces (up to order with examples) with examples		1	Interaction
	Type Study:*Scoliodon*		4	Chalk and Talk
	Accessory respiratory organs in fishes		1	PPT
	Types of Fins and function		1	Interaction
	Migration of Fishes		1	Lecture

Course designers: Dr. C. Selvakumar and Dr. B. Latha

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Zoology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Core	20U2ZMC4	Chordata – II	3	3	25	75	100

Course Objectives:
1. To understand the basic, systematic classification and evolution of higher vertebrates.
2. To identify the animals from Amphibia to Mammals and recognize their distinguishing features.
3. To appraise the diversity of animals in a phylogenetic context.
4. To understand the adaptive mechanisms of the animals to solve the biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of vertebrates in biological communities, ecological interactions, and conservation problems.

Unit-I: Amphibia
Classification and characters of Amphibia (up to order with examples).
Type Study: Frog
General topics: Metamorphosis of Amphibian, Limbless Amphibians, Parental care inAmphibian, Paedomorphosis.

Unit-II: Reptilia
Classification and characters of Reptilia (up to order with examples).
Type Study: *Calotes*
General topics: Identification of Poisonous and non-poisonous snakes – Poison apparatus and types of poison, Skull of Reptiles, Salient features of Chelonia &Crocodilia.

Unit-III: Aves
Classification and characters of Aves (up to order with examples).
Type Study: Pigeon
General topics: Flightless Birds, Flight Adaptations in Birds, Feet and Beak modifications, Acoustics in Birds, Migration in Birds.

Unit-IV: Mammals
Classification and characters of Mammals (up to order with examples).
Type Study: Rabbit
General topics: Aquatic mammals and adaptation, Dentition in Mammals

Unit-V: Chordate Phylogeny
Geological time scale, Chordate phylogeny, Evolution of Aortic Arches, Evolution of kidney and their ducts, Diversity of Marsupials, Affinities of Prototheria, Adaptive radiation in Mammals.

Books for Study

1. Thangamani A, Prasannakumar S, Narayanan L.M, Arumugam N, 2017. *A Text Book of Chordates,* Saras Publication, Nagercoil.
2. Kotpal R.L, 2017. *Modern Text Book of Zoology*: *Vertebrates*, Rastogi Publications, Meerut.
3. Arumugam N, 2019. *Animal Diversity – Chordata*, *Volume - 2*, Saras Publication, Nagercoil.

Books for References

1. EkambaranathaAyyar and Ananthakrishnan T.N. (Recent Edition), *Manual of Zoology Vol–II*, S. Viswanathan Pvt. Ltd. Chennai.
2. Young J.Z, 1950. *Life of Vertebrates.* Clarendon Press, Oxford, UK.
3. Pough Harvey F, Christine M, Janis and John B, Heiser, 2002. *Vertebrate Life*, Pearson Education Inc. New Delhi.
4. Verma P.S, 2010. *Chordate Zoology*, S Chand Publishers, New Delhi.

Web Resources

1. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-123
2. https://ucmp.berkeley.edu/vertebrates/vertintro.html
3. https://ucmp.berkeley.edu/chordata/chordata.html

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

		CLO Statement	Knowledge level
CLO-1		Understand the diversity and basic taxonomy from Amphibia to Mammals.	K1
CLO-2		List the general characters and outline classification from Amphibia to Mammals.	K2
CLO-3		Apply the knowledge to identify the fauna based on their unique characters.	K3
CLO-4		Analyse the importance and adaptation of fauna in their habitat.	K4
CLO-5		Assess the role of Chordates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
CLO-1	1	2	1	1			1	
CLO-2	1	3	3	3			3	
CLO-3	1	3	3	3			3	
CLO-4	1	3	3	3			3	
CLO-5	1	3	3	3			3	

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	1	2	1	2	
CLO-2	2	2	2	3	1
CLO-3	1	3	2	3	2
CLO-4	2	3	2	3	2
CLO-5	2	2	2	3	3

3- Advance application; 2- Intermediate level; 1- Basic level

BLUE PRINT
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K1	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
5	CLO 5	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	6	10	--	**21**	17.5	**42%**
K2	5	4	10	10	**29**	24.16	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN (Total hours: 45)

Unit	Description	Staff Name	Hours	Mode
I	General characters of Amphibia		1	Group Discussion
	Classification of Amphibia (up to order with examples)		1	Interaction
	Type Study: Frog		4	Chalk and Talk, Lecture
	Metamorphosis of Amphibian, Limbless Amphibians, Parental care inAmphibian, Paedomorphosis		3	Interaction, Group Discussion, PPT
II	General characters of Reptilia		1	Group Discussion
	Classification of Reptilia (up to order with examples)		1	Interaction
	Type Study: *Calotes*		4	Chalk and Talk
	Identification of Poisonous and non-poisonous snakes, Poison apparatus and types of poison		2	Interaction, Lecture, PPT
	Salient features of Chelonia &Crocodilia		1	PPT, Interaction
III	General characters of Aves		1	Group Discussion
	Classification of Aves (up to order with examples)		1	Interaction
	Type Study: Pigeon		4	Chalk and Talk
	Flightless Birds, Flight Adaptations in Birds		1	PPT, Interaction
	Feet and Beak modifications & Acoustics in Birds, Migration in Birds		2	PPT, Lecture, Interaction
IV	General characters of Mammals		1	Group Discussion
	Classification of Mammals (up to order with examples)		2	Interaction
	Type Study: Rabbit		4	Chalk and Talk
	Aquatic mammals and adaptation		1	Lecture
	Dentition in Mammals		1	PPT
V	Geological time scale		2	Group Discussion
	Chordate phylogeny		1	Interaction
	Evolution of Aortic Arches		2	Lecture
	Evolution of kidney and their ducts		1	PPT
	Diversity of Marsupials		1	Interaction
	Affinities of Prototheria		1	Lecture
	Adaptive radiation in Mammals		1	Interaction

Course designers: Dr. L.D. Devasree and Dr. R. Eswaran

Semester II: Mapping of Courses with Programme Specific Outcomes

Mapping with Programme outcomes:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
Chordata -1	1	2	3	2			3	
Chordata -2	1	2	3	2			3	
Major Practical-1	2	3	3				2	
Equity & Gender Studies	2							3

3- Advance application; 2- Intermediate level; 1- Basic level

Semester II: Mapping of Course Learning Outcomes with Programme Specific Outcomes:

		PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
	CLO-1	1	2	2	2			1	
	CLO-2	1	3	3	3			2	
Chordata –I	CLO-3	1	3	3	3			3	
	CLO-4	1	2	3	3			3	
	CLO-5	1	2	2	2			3	
	CLO-1	1	2	1	1			1	
	CLO-2	1	3	3	3			3	
Chordata –II	CLO-3	1	3	3	3			3	
	CLO-4	1	3	3	3			3	
	CLO-5	1	3	3	3			3	

3- Advance application; 2- Intermediate level; 1- Basic level

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Chemistry				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Allied	20U1ZAC1	Fundamentals of Invertebrates & Chordates	4	4	25	75	100

Course Objectives:
1. To understand the general characters and outline classification of Invertebrate and Chordate.
2. To identify the animals and recognize their distinguishing features.
3. To appraise the specific features of animal and their life cycle.
4. To understand the morphology and adaptations of animals in the context of evolution.
5. To learn how different body designs solve biological problems related to physiological and environmental challenges.

Unit-I: Classification, Protista & Porifera
Systems of classification and nomenclature, Levels of organization, Types of symmetry. General characters and outline classification of invertebrates (up to phylum) with examples. Life cycle of *Plasmodium*, Canal system in sponges, Corals and coral reefs.

Unit-II: Platyhelminthes, Annelida& Arthropoda
Parasitic adaptation in helminthic worms, Metamerism in Annelida, Metamorphosis in insects, Mouth parts in insects, Affinities of Peripatus.

Unit-III: Mollusca, Echinodermata & Chordata
Torsion in Mollusca, Economic importance of Mollusca, Water vascular system in starfish.
General characters and outline classification of Chordates (up to class) with examples.

Unit-IV: Prochordates & Fishes
General characters and classification of Urochordates, Cephalochordates and Hemichordates (up to class) with examples, Parental care in fishes, Migration of fishes.

Unit-V: Amphibia, Reptilia, Birds & Mammals
Neoteny in Amphibians, Poisonous snakes of south India (Cobra and krait), Identification of poisonous and non poisonous snakes, Flight adaptations in birds, Egg laying and pouched mammals, Adaptive radiation in mammals.

Books for Study
1. Nair N.C, Leelavathy S, Soundara Pandian N, Murugan T and Arumugam N, 2017. *A Text Book ofInvertebrates,* Saras Publication, Nagercoil.
2. Thangamani A, Prasannakumar S, Narayanan L.M and Arumugam N, 2017. *A Text Book ofChordates,* SarasPublication, Nagercoil.
3. Nair N.C, Thangamani A, Leelavathy S, Prasanakumar S, Soundrapandian N, Murugan T, Narayanan L.M and Arumugam N, 2017. *Animal diversity (Invertebrata& Chordata)*, Saras Publication, Nagarcoil.
4. Arumugam N, 2019. *Animal Diversity – Chordata*, *Volume - 2*, Saras Publication, Nagercoil.
5. Kotpal R.L, 2017. *Modern Text Book of Zoology*:*Invertebrate*, Rastogi Publications, Meerut.
6. Kotpal R.L, 2017. *Modern text book of Zoology*:*Vertebrates*, Rastogi Publications, Meerut.

Books for References

1. Barnes R.D. 2006. *Invertebrate Zoology* (1982) VIIth Edition, Holt Saunders International Edition.
2. EkambaranathaAyyar and AnanthakrishnanT.N , *Manual of Zoology Vol–I, Part I &II,* S.ViswanathanPvt. Ltd. Chennai.
3. Kotpal R.L, Agarwal S.K and Khetarpal R.P, 1990. *Invertebrates,* Rastogi Publications, Meerut.
4. Anderson D.T, 2001. *Invertebrate Zoology*, Oxford University Press, New Delhi.
5. Verma P.S, 2010. *Chordate Zoology*, S Chand Publishers, New Delhi.

Web Resources

1. https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates
2. https://biologydictionary.net/invertebrate/
3. https://basicbiology.net/animal/invertebrates
4. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-121
5. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-122
6. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-123
7. https://ucmp.berkeley.edu/vertebrates/vertintro.html
8. https://ucmp.berkeley.edu/chordata/chordata.html

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

	CLO Statement	Knowledge level
CLO-1	Understand the diversity and basic taxonomy of Invertebrates and Chordates.	K1
CLO-2	List the general characters and outline classification of Invertebrates and Chordates.	K2
CLO-3	Apply the knowledge to identify the Invertebrate and Chordate fauna based on their unique characters.	K3
CLO-4	Analyse the importance and specific adaptation of Invertebrate and Chordates in their habitat.	K4
CLO-5	Examine the role of Invertebrate and Chordates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes of Chemistry:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
CLO-1	2		1	1				
CLO-2	2		1	1				
CLO-3	2							
CLO-4	2		1					
CLO-5	2	2	2	1	2	2		

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	1	2	
CLO-2	2	2	2	2	
CLO-3	2	3	3	3	2
CLO-4	2	2	2	3	3
CLO-5	2	2	2	3	3

3- Advance application; 2- Intermediate level; 1- Basic level

BLUE PRINT
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	2	10	--	**17**	14.16	**42%**
K2	5	8	10	10	**33**	27.5	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN (Total hours: 60)

Unit	Description	Staff Name	Hours	Mode
I	Systems of classification & nomenclature		1	Group Discussion
	Levels of organization		1	Interaction
	Types of symmetry		1	Group Discussion
	General characters of Invertebrates		1	Interaction
	Classification of Invertebrates (up to phylum) with examples		2	Group Discussion
	Life cycle of *Plasmodium*		2	Chalk and Talk
	Canal system in sponges		2	PPT
	Corals and coral reefs		2	Lecture
II	Parasitic adaptation in helminthic worms		3	Group Discussion
	Metamerism in Annelida		2	Interaction
	Metamorphosis in insects		2	Chalk and Talk
	Mouth parts in insects		3	PPT
	Affinities of Peripatus		2	Lecture
III	Torsion in Mollusca		3	Group Discussion
	Economic importance of Mollusca		3	Interaction
	Water vascular system in starfish		2	Chalk and Talk
	General characters of Chordates		2	PPT
	Classification of Chordates (up to class) with examples		2	Lecture
IV	General characters and classification of Urochordates (up to class) with examples		2	Group Discussion
	General characters of and classification Cephalochordates (up to class) with examples		3	Interaction
	General characters and classification of Hemichordates (up to class) with examples		2	Group Discussion
	Parental care in fishes		3	PPT
	Migration of fishes		2	Lecture
V	Neoteny in Amphibians		2	Group Discussion
	Poisonous snakes of south India (Cobra and krait)		2	Interaction
	Identification of poisonous and non poisonous snakes		2	Chalk and Talk
	Flight adaptations in birds		2	PPT
	Egg laying and pouched mammals		2	Interaction
	Adaptive radiation in mammals		2	Lecture

Course designers: Dr. C. Selvakumar and Mrs. P. Sumathi

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Chemistry				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Allied	20U2ZAC2	Applied Zoology	4	4	25	75	100

Course Objectives:
1. To understand the economic importance of animals.
2. To create awareness among the students about the applied aspects of Zoology.
3. To gain knowledge on various techniques employed in different culture systems.
4. To apply efficiently and execute the methodology for field practice.
5. To motivate the students for the self employment.

Unit-I: Apiculture & Lac culture
Introduction to Apiculture, Types of honey bees, Bee colony, Newton's bee hive, management of an apiary, uses of honey, Bee wax and Bee venom. Lac culture: Life history and rearing of lac insects and uses of lac.

Unit-II: Sericulture
Types of silkworm, Life cycle of silkworm, Rearing of silkworm, Silk glands, diseases of silkworm (Pebrine, Muscardine and Flacherie), Role of Central Silk Board.

Unit-III: Poultry & Dairy farming
Poultry: Breeds of poultry, Types of poultry house and Principles for construction of poultry house, Nutrition, Diseases and control. Dairyfarming: Economically important cattle, Nutritive value of milk, Livestock diseases: Mastitis, Foot and mouth diseases and Rinder pest.

Unit-IV: Pisciculture & Vermiculture
Pisciculture: Types of culturable fishes (fin fishes and shell fishes), Polyculture of carps.
Vermiculture: Species, methods of culture, vermiwash, uses of vermicompost.

Unit-V: Edible & Pearl Oyster farming
Edible oyster farming: Biology, spat collection, culture methods, harvesting, cleaning and preservation. PearlOysterfarming: pearl formation and culture of pearls. Seaweed culture: culture methods and uses of seaweeds.

Books for Study
1. Tomer B.S, 2011. *Economic Zoology*, Emkay publications, Delhi.
2. Arumugam N, Murugan S, Johnson Rajeshwar J and Ramprabha R, 2005. *Applied Zoology*, Saras publication, Nagercoil.
3. Johnson M and Kesary M, 2008. *Sericulture*IVth Edition, N.M.C. College, Marthandam.
4. Ganga G and Sulochanachetty J, 2000. *An Introduction to Sericulture*, Oxford & IBH Publishing Company Pvt. Ltd. New Delhi.
5. Arumugam N, 2000. *Aquaculture*, Saras publication, Nagercoil.
6. Mery Violet Chrity A, 2014. *Vermitechnology*, MJP Publishers, New Delhi.

Books for References

1. Ravindranathan K.R, 2005. *A text book of economic zoology*, Dominant publishers and distributors, New Delhi.
2. Vasantharaj David B and Kumaraswamy T, 1996. *Elements of Economic Entomology*, Popular book depot, Chennai.
3. Venkatanarasaiah P, 2013. *Sericulture*, APH Publishing Corporation, New Delhi.

Resources

1. http://agritech.tnau.ac.in/farm_enterprises/fe_apiculture_home.html
2. http://agritech.tnau.ac.in/sericulture/seri_index.html
3. http://www.agritech.tnau.ac.in/expert_system/poultry/index.html
4. http://agritech.tnau.ac.in/animal_husbandry/animhus_cattle%20_index_page.html
5. http://agritech.tnau.ac.in/fishery/fish_index.html
6. http://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

CLOs	CLO Statement	Knowledge level
CLO-1	Relate the economic importance of Zoology in human welfare.	K1
CLO-2	Understand the insect and animal types, rearing techniques and it uses.	K2
CLO-3	Apply the knowledge to execute the methodology for field practice.	K3
CLO-4	Analyse the problem in culture practices and to rectify the same.	K4
CLO-5	Infer the biological importance of Apiculture, Lac culture, Sericulture, Poultry farming, Dairy farming, Pisciculture, Vermiculture, Edible oyster and Perl oyster culture.	K4

Mapping with Programme Specific Outcomes of Chemistry:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
CLO-1	2		1			2		
CLO-2	2		1			2		
CLO-3	2		2			2	2	
CLO-4	2	1	2	1		2		
CLO-5	2					1		

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	2	3	3
CLO-2	1	2	2	3	2
CLO-3	2	2	2	3	3
CLO-4	2	3	2	3	3
CLO-5	2	3	2	3	3

3- Advance application; 2- Intermediate level; 1- Basic level

BLUE PRINT
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	2	10	--	**17**	14.17	**42%**
K2	5	8	10	10	**33**	27.5	
K3	-	-	10	30	**40**	33.33	**33%**
K4	-	-	20	10	**30**	25	**25%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN (Total hours: 60)

Unit	Description	Staff Name	Hours	Mode
I	Introduction to Apiculture		1	Group Discussion
	Types of honey bees		1	PPT
	Bee colony		1	Interaction
	Newton's bee hive		1	Group Discussion
	Management of an apiary		2	Interaction
	Uses of honey		1	Chalk and Talk
	Bee wax &Bee venom		2	Lecture
	Life history of lac insects		1	Group Discussion
	Rearing of lac insects		1	Lecture
	Uses of lac		1	Interaction
II	Types of silkworm		2	Group Discussion
	Life cycle of silkworm		2	Interaction
	Rearing of silkworm		2	Chalk and Talk
	Silk glands		1	Lecture
	Disease of silkworm (Pebrine)		1	Chalk and Talk
	Disease of silkworm (Muscardine)		1	Chalk and Talk
	Disease of silkworm (Flacherie)		1	Chalk and Talk
	Role of Central Silk Board		2	Interaction
III	Breeds of poultry		2	Group Discussion
	Types of poultry house		1	Interaction
	Principles for construction of poultry house		2	Chalk and Talk
	Nutrition		1	Interaction
	Poultry diseases and control		2	Lecture
	Economically important cattle		2	PPT
	Nutritive value of milk		1	Interaction
	Livestock diseases: Mastitis, Foot and mouth diseases and Rinder pest		1	Chalk and Talk
IV	Types of culturable fishes (fin fishes)		2	Group Discussion
	Types of culturable fishes (shell fishes)		2	Interaction
	Polyculture of carps		2	Chalk and Talk
	Vermiculture: Species		2	PPT
	Methods of vermiculture		2	Interaction
	Vermiwash		1	Lecture
	Uses of vermicompost		1	Interaction
V	Biology of Edible Oyster		2	Group Discussion
	EdibleOysterfarming: Spat collection		1	Interaction
	EdibleOysterfarming: culture methods, harvesting, cleaning and preservation		2	Chalk and Talk
	PearlOysterfarming: pearl formation		2	Chalk and Talk
	Culture of pearls		2	PPT
	Seaweed culture: culture methods		2	Lecture
	Uses of seaweeds		1	Interaction

Course designers: Dr. L.D. Devasree and Mrs. P. Sumathi

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Zoology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I & II	Core	20U2ZMP1	Major Practical – I	3	3	40	60	100

Mountings

Body Setae of Earth worm

Mouth parts of Cockroach

Salivary glands of Cockroach

Placoid scales of Shark

Brain of frog (Procedure with illustration)

Dissections

Digestive system of Cockroach

Nervous system of Cockroach

Reproductive system of Cockroach

V cranial nerve of Frog (Procedure with illustration)

Spotters:

Invertebrata

Amoeba, Euglena, Paramoecium, Trypanpsoma, Elphidium, Noctiluca, Spicules, Obelia, Physalia, Porpita, Pennatula, Adamsia, Fungia, Tape worm, Redia larva, Cercaria, Liver fluke, Planaria, Ascaris, Dracunculus, Chaetopterus, Arenicola, Aphrodite, Leech, Sacculina, Albunea, Scolopendra, Limulus, Scorpion, Aplysia, Vaginulus, Pinctada, Octopus, Nautilus, Chiton, Dentalium, Star fish, Bipinnaria larva.

Chordata

Amphioxus, Balanoglassus, Ascidian, Doliolum, Petromyzon, Narcine, Trygon, Hippocampus, Echeneis, Exocetes, Cynoglossus, Rhacophorus, Uracotyphlus, Axolotle, Tadpole larva, Draco, Chameleon, Typhlops, Bungarus, Naja, Viper, Enhydrina, Eudynamys, King fisher, Ant eater, Loris and Pteropus.

Books for References

1. Jayasurya, Nair N.C, Soundarapandian N, Arumugem N, Leelavathy S and Murugan T, 2013. *Practical Zoology Vol. 1 Invertebrata*, Saras publication, Nagercoil.
2. Jayasurya, Thangamani A, Arumugam N, Prasanakumar S and Narayanan L.M, 2013. *Practical Zoology Vol. 2 Chordata*, Saras publication, Nagercoil.
3. Sinha J, Chatterjee A.K and Chattopadhyay P, 2011. *Advanced practical zoology*, Books and Allied (P) Ltd., Kolkata.

Web Resources

1. https://www.youtube.com/watch?v=wF7ew2w24as

Pedagogy

PPT, group discussion, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

CLOs	CLO Statement	Knowledge level
CLO-1	Recall the diversity of Invertebrates and Chordates.	K1
CLO-2	Understand the structure and functions of the organism.	K2
CLO-3	Apply the knowledge to identify the Invertebrates and Chordate fauna based on their unique characters.	K3
CLO-4	Analyse the organs/systems and their role in Invertebrates and Chordates.	K4
CLO-5	Examine the role of Invertebrates and Chordates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes:

	PSO-1	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**
CLO-1	2	2					1	
CLO-2	1	2	3				3	
CLO-3	1	3	2	1			3	
CLO-4	1	3	3	2			3	
CLO-5	1	2	3	2			3	

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**
CLO-1	2	2		2	2
CLO-2	2	2	1	2	2
CLO-3	2	3	2	3	2
CLO-4	2	2		2	
CLO-5	2	2	1	3	3

3- Advance application; 2- Intermediate level; 1- Basic level

LESSON PLAN FOR ODD SEMESTER (Total hours: 45)

Cycle	Description	Staff Name	Hours	Mode
Dissection				
1	Digestive system of Cockroach		3	Procedure with illustration
2	Nervous system of Cockroach		3	Procedure with illustration
3	Reproductive system of Cockroach		3	Procedure with illustration
4	V Cranial nerve of Frog		3	Procedure with illustration
Mountings				
5	Body setae of Earth worm		3	Mounting
6	Mouth parts of Cockroach		3	Mounting
7	Salivary glands of Cockroach		3	Mounting
8	Placoid scales of Shark		3	Mounting
9	Brain of frog		3	Procedure with illustration
Spotters				
10	Amoeba, Euglena, Paramoecium, Trypanosoma		3	Slides
11	Elphidium, Noctiluca, Spicules, Obelia		3	Slides & Specimen
12	Physalia, Porpita, Pennatula, Adamsia		3	Specimens & Images
13	Fungia, Tape worm, Redia larvaCercaria		3	Specimens & Images
14	Liver fluke, Planaria, Ascaris, Dracunculus		3	Specimens & Images
15	Internal Practical Test – I		3	

LESSON PLAN FOR EVEN SEMESTER (Total hours: 45)

Cycle	Description	Staff Name	Hours	Mode
Spotters				
1	Chaetopterus, Arenicola, Aphrodite, Leech		3	Specimens & Images
2	*Sacculina, Albunea*, *Scolopendra*, *Limulus*		3	Specimens & Images
3	Scorpion, *Aplysia*, *Vaginulus, Pinctada*		3	Specimens & Images
4	Octopus, Nautilus, Chiton, Dentalium		3	Specimens & Images
5	Star fish, Bipinnaria larva, Amphioxus, Balanoglossus		3	Specimens, Images
6	Ascidian,Doliolum,Petromyzon		3	Specimens & Images
7	Narcine, Trygon, Hippocampus		3	Specimens & Images
8	Echeneis, Exocetes, Cynoglossus		3	Specimens & Images
9	Rhacophorus, Uracotyphlus, Axolotle, Tadpole larva		3	Specimens & Images
10	Draco, Chameleon, Typhlops		3	Specimens & Images
11	Bungarus, Naja, Viper		3	Specimens & Images
12	Enhydrina, Eudynamys, King fisher		3	Specimens & Images
13	Ant eater, Loris and Pteropus		3	Specimens & Images
14	Internal Practical Test – II		3	
15	Summative Practical Examination		3	

Course designers: Dr. S. Dinakaran and Mrs. P. Sumathi

DEPARTMENT OF ZOOLOGY				CLASS: I B.Sc. Chemistry				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I & II	Allied	20U2ZAP1	Zoology Ancillary Practical – I	2	2	40	60	100

Dissection

> Digestive system of Cockroach
> Reproductive system of Cockroach

Virtual Dissection

> Frog Arterial system
> Fifth cranial nerve
> Urinogenetal system

Mountings

> Earth worm: Body Setae
> Cockroach: Mouth parts and Salivary glands
> House fly: Mouth parts
> Honey Bee: Mouth parts
> Brain of Frog (Procedure with illustration)

Spotters

Trypanosoma, Obelia, Ephyra, Taenia, Ascaris, Dracunculus, Leech, Trochophore larva, Appendages of prawn, Nauplius, Albunia, Glochidium, Star fish, Bipinnaria larva, Amphioxus, Placoid scale, Axolotl larva, Frog - Osteology, Poisonous snakes of south India, Feather of bird.
(Note: Mounting and dissections are to be done by using live specimen or virtual method or slides and preserved specimens from archives).

Books for References

1. Jayasurya, Nair N.C, Soundarapandian N, Arumugem N, Leelavathy S and Murugan T, 2013. *Practical Zoology Vol. 1 Invertebrata*, Saras publication, Nagercoil.
2. Jayasurya, Thangamani A, Arumugam N, Prasanakumar S and Narayanan L.M, 2013. *Practical Zoology Vol. 2 Chordata*, Saras publication, Nagercoil.
3. Sinha J, Chatterjee A.K and Chattopadhyay P, 2011. *Advanced practical zoology*, Books and Allied (P) Ltd., Kolkata.

Web Resources

1. https://www.youtube.com/watch?v=wF7ew2w24as

Pedagogy

> PPT, group discussion, interaction, quiz, tutorial and virtual labs.

Course Learning Outcomes:

CLOs	CLO Statement	Knowledge level
CLO-1	Recall the diversity of Invertebrates and Chordates.	K1
CLO-2	Understand the structure and functions of the organism.	K2
CLO-3	Apply the knowledge to identify the Invertebrate and Chordate fauna based on their unique characters.	K3
CLO-4	Analyse the organs/systems and their role in Invertebrate and Chordates.	K4
CLO-5	Examine the role of Invertebrates and Chordates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes:

	PSO-1	**PSO-2**	**PSO-3**	**PSO-4**	**PSO-5**	**PSO-6**	**PSO-7**	**PSO-8**
CLO-1	1	1	1	1			1	
CLO-2	1	2	3	3			3	
CLO-3	1	3	3	3			3	
CLO-4	1	3	3	3			3	
CLO-5	1	2	2	1	2	2	2	

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes:

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**
CLO-1	2	2		2	
CLO-2	2	2		2	
CLO-3	2	2	1	3	2
CLO-4	2	2	2	2	1
CLO-5	2	2		3	3

3- Advance application; 2- Intermediate level; 1- Basic level

LESSON PLAN FOR ODD SEMESTER (Total hours: 30)

Cycle	Description	Staff Name	Hours	Mode
Dissection				
1	Digestive system of Cockroach		2	Procedure with illustration
2	Reproductive system of Cockroach		2	Procedure with illustration
Virtual Dissection				
3	Arterial system of frog		2 \	Procedure with illustration
4	V Cranial nerve of frog		2	Procedure with illustration
5	Urinogenital system of frog		2	Procedure with illustration
Mountings				
6	Body setae of Earthworm		2	Mounting
7	Mouth parts of Cockroach		2	Mounting
8	Salivary glands of Cockroach		2	Mounting
9	Mouth parts of Housefly		2	Mounting
10	Mouth parts of Honey bee		2	Mounting
11	Brain of Frog		2	Procedure with illustration
Spotters				
12	*Trypanosoma*, *Obelia*		2	Specimen & Image
13	Ephyra, *Taenia*		2	Specimen & Image
14	*Ascaris*, *Dracunculus*		2	Specimen & Image
15	Internal Practical Test – I		2	

LESSON PLAN FOR EVEN SEMESTER (Total hours: 30)

Cycle	Description	Staff Name	Hours	Mode
Spotters				
1	Leech, Trochophore larva		2	Specimen & Image
2	Appendages of Prawn		2	Specimen & Image
3	Appendages of Prawn		2	Specimen & Image
4	Appendages of Prawn		2	Specimen & Image
5	*Albunea*, Nauplius		2	Specimen & Image
6	Glochidium, Star fish		2	Specimen & Image
7	Bipinnaria larva, Amphioxus		2	Specimen & Image
8	Placoid scale, Axolotl larva		2	Specimen & Image
9	Frog Osteology		2	Image
10	Frog Osteology		2	Image
11	Poisonous snakes of south India		2	Specimen & Image
12	Poisonous snakes of south India		2	Specimen & Image
13	Feather of Bird		2	Specimen & Image
14	Internal Practical Test – II		2	
15	Summative Practical Examination		2	

Course designers: Dr. L.D. Devasree and Dr. R. Eswaran

Department of Computer Science

Revised Curriculum
(Choice Based Credit system with Outcome Based Education)
Academic Year 2020-2021 onwards

THE MADURA COLLEGE (AUTONOMOUS), MADURAI-11.
DEPARTMENT OF COMPUTER SCIENCE

VISION
- ❖ To disseminate quality education in Computer science and related fields to the students make them fit and have strong foundation to compete the challenges in the Computer world.
- ❖ To be frontier in educating computer knowledge and to produce competent graduates with moral values.

MISSION
- ❖ To implement appropriate and relevant educational programs through quality teaching and learning methods
- ❖ To explore the skills of the students through student centric activities based on Hands on training
- ❖ To create a learning environment for enhancing their innovated ideas, problem solving skills, leadership qualities and team spirit
- ❖ To produce skilled graduates with a creative mind-set who can recognize a computational problem either in IT industry or society, and develop effective solutions.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

PEO-1	Graduates of the programme acquires the knowledge with computer basics and builds a base for entry level jobs in IT companies.
PEO-2	Graduates of the programme will be able to pursue higher studies in the area of computer science /Applications.
PEO-3	Graduates of the programme will apply new technologies in computer science to serve the needs of IT industries, government and society.
PEO-4	Graduates of the programme will Remain abreast in their profession and be leaders in our technologically vibrant society.
PEO-5	Graduate of this programme will be more successful in technical or professional carrier on multidisciplinary area.

PROGRAMME LEARNING OUTCOMES (PLOs) :
On the successful completion of B.Sc. Computer Science degree, the students will

PSO-1 (Knowledge Base)	Develop an ability to apply knowledge of mathematics, basic science and computational methods.
PSO-2 (Problem analysis & Investigation)	Understand the basic concepts of system software, hardware, software development tools and open-source platforms.
PSO-3 (Communication Skills)	Develop ability to communicative and expertise in programming skills with effective and efficient real time solutions using high-level programming languages to solve computer-oriented problems.
PSO-4 (Individual and Team work)	Perceive technical, practical exposure and gaining ability to work as a member and team to face the industrial needs.
PSO-5 (Life long learning)	Aspires educational needs in the modern world to pursue professional studies and develop a passion to become solution provider in the field of IT.
PSO-6 (Professionalism Ethics and equity)	Inculcate positive attitude to become a responsible citizen with ethics and taking care on the needs of society and the importance of social obligations.

Courses of Study with Credit Distribution

Part	Category	No. of Courses	No. of Credits
I	Language (Tamil)	4	12
II	English	3	9
III	Allied	4	16
	Core	12	50
	Major Practical	8	20
	Elective	4	12
	Skill Based Elective	4	8
IV	Non Major Elective	2	4
Common	Value Education	1	3
	Environmental Studies	1	2
	Soft Skills (English)	1	3
V	Extension Activity	1	1
	Total	**45**	**140**

Evaluation

Internal (Formative)	: 25 marks
External (Summative)	: 75 marks
Total	:100 marks

Continuous Internal Assessment (CIA) : 25 Marks

Components	Marks
Test (Average of two tests)(Conducted for 30 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

- ✓ Centralized system of Internal Assessment Tests
- ✓ There will be a two internal assessment tests
- ✓ Duration of Internal assessment test will be 2 hours
- ✓ Students shall write retest on the genuine grounds if they are absent in either Test I or Test II with the approval of HOD and the Principal

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

Sl. No	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short Answers No. of Questions	Section B Short Answers K-Level	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO 1	Up to K	2	K1&	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1&	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K	2	K1&	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K	2	K1&	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K	2	K1&	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

In respect of external examinations passing minimum is 35% for Under Graduate Courses and in total, aggregate of 40%.

The curriculum is revised to suit the changing trends by propagation of technical ideas ensuring professional growth through innovative method of teaching. The curriculum is strengthened through the latest amendments and revisions as per UGC and TANSCHE Norms.

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Department of Computer science

Course Structure under CBCS & OBE Pattern with effect from the Academic Year 2020-21 Onwards.

SEMESTER-I

Part	category	Sub.code	Title of the paper	No of hours.	credits	Int. marks	Ext. marks	Total marks
I	Language-1		Tamil / hindi / Sanskrit	6	3	25	75	100
II	English-1		English-1	6	3	25	75	100
III	core-1	20U1DMC1	Programming in C	4	3	25	75	100
III	core-2	20U1DMC2	Digital computer fundamentals	4	3	25	75	100
III	Allied-1	20U1DAT1	Discrete mathematics	4	3	25	75	100
III	Practical-1	20U1DMCP1	C programming lab.	3	2	50	50	100
IV	VE & PE	20U1DVE1	Value education	3	3	25	75	100
			TOTAL	30	20			

SEMESTER - II

Part	category	Sub.code	Title of the paper	No of hours.	credits	Int. marks	Ext. marks	Total marks
I	Language-2		Tamil/hindi/Sanskrit	6	3	25	75	100
II	English-2		English-1	6	3	25	75	100
III	core-3	20U2DMC3	Data structures and algorithms	4	3	25	75	100
III	core-4	20U2DMC4	Computer organisation and architecture	4	3	25	75	100
III	Allied-2	20U2DAT2	Microprocessors 8086/88	4	3	25	25	100
III	Practical-2	20U2DMCP2	Data structures lab using c	3	3	50	50	100
IV	EVS	20U2DES1	Environmental studies	3	3	25	75	100
			Extension activity	---	1			
			TOTAL	30	22			

SEMESTER - III

Part	category	Sub.code	Title of the paper	No of hours.	credits	Int. marks	Ext. marks	Total marks
I	Language-3		Tamil / hindi /Sanskrit	6	3	25	75	100
II	English-3		English-3	6	3	25	75	100
III	Core-5	20U3DMC5	Operating systems	5	3	25	75	100
III	SBE-1	20U3DSM1	Visual programming	2	2	25	75	100
III	NME-1	20U3DNM1	Computer fundamentals	2	2	25	75	100
III	Allied-3	20U3DAT3	Computerised accounting using TALLY	6	5	25	75	100
III	Practical-3	20U3DMCP3	Visual programming lab.	3	2	50	50	100
			TOTAL	30	20			

SEMESTER - IV

Part	category	Sub.code	Title of the paper	No of hours.	credits	Int. marks	Ext. marks	Total marks
I	Language-4		Tamil/hindi/Sanskrit	6	3	25	75	100
II	English-4		English-4 (SS)	6	3	25	75	100
III	Core-6	20U4DMC6	Linux & shell programming	5	3	25	75	100
III	SBE-2	20U4DSM2	Office automation	2	2	25	75	100
III	NME-2	20U4DNM2	Introduction to Internet	2	2	25	75	100
III	Allied- 4	20U4DAT4	Resource management techniques	6	5	25	75	100
III	Practical-4	20U4DMCP4	LINUX lab	3	2	50	50	100
			TOTAL	30	20			

SEMESTER - V

Part	category	Sub. code	Title of the paper	No of hours.	credits	Int. marks	Ext. marks	Total marks
III	Core-7	20U5DMC7	Programming in JAVA	5	5	25	75	100
III	Core-8	20U5DMC8	Relational database management systems	5	5	25	75	100
III	Core-9	20U5DMC9	Computer networks	5	5	25	75	100
III	SBE-3	20U5DSM3	Android programming	2	2	25	75	100
III	Practical-5	20U5DMCP5	JAVA programming lab	3	3	50	50	100
III	Practical-6	20U5DMCP6	SQL & PL/SQL lab	3	3	50	50	100
III	Elective-1	20U5DME1	Data mining and data warehouse/client server computing/computer graphics	4	3	25	75	100
III	Elective-2	20U5DME2	Multimedia systems/Programming in ASP/ Cryptography & network security	3	3	25	75	100
			TOTAL	30	29			

SEMESTER-VI

Part	category	Sub. code	Title of the paper	No of hours	credits	Int. marks	Ext. marks	Total marks
III	Core-10	20U6DMC10	Web technology	5	5	25	75	100
III	Core-11	20U6DMC11	Programming in Python	5	5	25	75	100
III	Core-12	20U6DMC12	Software engineering	5	5	25	75	100
III	Elective-3	20U6DME3	E-Commerce technologies/Mobile computing/Information security	4	3	25	75	100
III	Elective - 4	20U6DME4	Internet programming/ Network security / Software testing	3	3	25	75	100
III	SBE-4	20U6DSM4	Android programming	2	2	25	75	100
III	Practical-7	20U6DMP7	Web technologies lab	3	3	50	50	100
III	Practical-8	20U6DMP8	Python lab	3	3	50	50	100
			TOTAL	30	29			
			GRAND TOTAL	**180**	**140**			

Course Structure under CBCS & OBE Pattern with effect from the Academic Year 2020-21 Onwards.

Semester wise Mapping of Courses with
Programme Learning Outcomes (PLOs)

	Programme Learning Outcomes	**C1- MCT-1** Programming in C	**C2 – MCP-1** C Programming Lab	**C3-MCT-2** Digital Computer Fundamentals	**C4-ACT-1** Discrete Mathematics
G R A D U A T E A T T R I B U T E S	*PLO 1 (Knowledge Base)*	3	3	3	3
	PLO 2 (Problem Analysis & Investigation)	3	3	2	3
	PLO 3 (Communication Skills & Design)	1	2	3	2
	PLO 4 (Individual and Team Work)	3	3	2	3
	PLO 5 (Professionalism Ethics and equity)	2	3	2	2
	PLO 6 (Life Long Learning)	3	3	3	3

3- Advanced Application   2- Intermediate Development   1-Introductory Level

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I Year B.Sc. Computer Science
Semester-1

Sl. No.	Part		Title of the paper	No of hours.	credits
1	Part-I	Language-1	TAMIL / SANSKRIT / HINDI	6	3
2	Part-II	Language-2	ENGLISH - I	6	3
3	Part-III	Major core-1	PROGRAMMING IN C	4	3
4	Part-III	Major core-2	DIGITAL COMPUTER FUNDAMENTALS	4	3
5	Part-III	Allied theory-1	DISCRETE MATHEMATICS	4	3
6	Part-III	Major Practical-1	PRACTICAL-1 C PROGRAMMING	3	2
7	Part-IV		VALUE EDUCATION	3	3
			TOTAL	30	20

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 1	20U1DMC1	Programming in C	3	4	25	75	100

Course Objectives:

This course is designed to provide a comprehensive study of the C programming language and rendering basic programming concepts.

Units	Programming in C --Course Contents	Total Hours: 60
Unit -I	C fundamentals Character set - Identifier and keywords - data types - constants - Variables - Declarations - Expressions - Statements - Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators - Library functions.	12 hrs
Unit-2	Data input output functions - Simple C programs - Flow of control - if, if-else, while, do-while, for loop, Nested control structures - Switch, break and continue, go to statements - Comma operator.	12 hrs
Unit-3	Functions -Definition - proto-types - Passing arguments - Recursions. Storage Classes - Automatic, External, Static, Register Variables - Multi-file programs.	12 hrs
Unit-4	Arrays - Defining and Processing - Passing arrays to functions - Multi-dimension arrays - Arrays and String. Structures - User defined data types - Passing structures to functions - Self-referential structures - Unions - Bit wise operations.	12 hrs
Unit-5	Pointers - Declarations - Passing pointers to Functions - Operation in Pointers - Pointer and Arrays - Arrays of Pointers - Structures and Pointers - Files: Creating Processing, Opening and Closing a data file.	12 hrs

Text Book
1. E. Balagurusamy, "Programming in ANSI C", Fifth Edition, Tata McGraw Hill.

Reference Books
1. B.W. Kernighan and D M.Ritchie, "The C Programming Language", 2nd Edition, PHI, 1988.
2. H. Schildt, "C: The Complete Reference", 4th Edition. TMH Edition, 2000.
3. Gottfried B.S, "Programming with C", Second Edition, TMH Pub. Co. Ltd., New Delhi 1996.
4. Kanetkar Y., "Let us C", BPB Pub., New Delhi, 1999.

Lesson Plan:

Unit	Topics	Hrs	Mode
Unit I	C fundamentals -Character set - Identifier and keywords	3	Chalk and talk, Quiz and assignment
	Data types - constants - Variables	2	
	Declarations- Expressions - Statements	2	
	Operators - Arithmetic, Unary, Relational ,logical operator	3	
	Assignment and Conditional Operators- Library functions Library functions.	2	
Unit II	Data input output functions - Simple C programs	2	Chalk and talk, Group discussion
	Flow of control - if, if-else statement	3	
	Looping statement- while, do-while, for loop, Nested loop	3	
	control structures - Switch, break and continue	2	
	go to statements - Comma operator.	2	
Unit III	Functions -Definition - proto-types	3	Chalk and talk, Quiz and assignment
	Passing arguments - Recursions	3	
	Storage Classes - Automatic, External	3	
	Static, Register Variables - Multi-file programs.	3	
Unit IV	Arrays - Defining and Processing	2	PPT, Chalk and talk, Quiz and assignment
	Passing arrays to functions	2	
	Multi-dimension arrays - Arrays and String.	2	
	Structures - User defined data types - Passing structures to functions	3	
	Self-referential structures - Unions - Bit wise operations.	3	
Unit V	Pointers - Declarations	2	PPT, Chalk and talk, Quiz and assignment
	Passing pointers to Functions - Operation in Pointers	3	
	Pointer and Arrays - Arrays of Pointers	3	
	Structures and Pointers – Files- Creating Processing	2	
	Creating Processing, Opening and Closing a data file.	2	

COURSE LEARNING OUTCOMES:

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

	COURSE LEARNING OUTCOMES	**Knowledge Level (basis of Bloom's Taxonomy)**
CLO-1	Know the knowledge of the structured programming and basic syntax of 'C' language.	K1 , K3
CLO-2	Identify the fundamental operators, data types and all library functions	K4
CLO-3	Identify and design the various features such as Flow control and control structures.	K4, K3
CLO-4	Analyse and construct the programs for Bitwise operators, Union and Structure concept	K2,K4
CLO-5	Design C programs with the concept of pointers, pointers & Arrays, Pointers & Files.	K4
CLO-6	Construct a file program with various operations like create, open, close, process and close.	K4

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	3	3	2	3	2
CLO-2	1	2	2	1	2	1
CLO-3	3	3	3	3	3	2
CLO-4	2	2	3	1	2	3
CLO-5	2	2	3	2	2	3
CLO-6	3	3	3	2	3	2

3- Advanced Application   2- Intermediate   1- Introductory

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 2	20U1DMC2	Digital Computer Fundamentals	3	4	25	75	100

Course Objectives:

This is designed to understand fundamental concepts and features digital Computer and lead to learn the building blocks of the digital computer system

Units	Digital computer fundamentals --Course Contents	Total Hours: 60
Unit -I	Number Systems and Codes: Number System – Base Conversion – Binary Codes – Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.	12 hrs
Unit-2	Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions – Using Theorems, K-Map, Prime – Implicant Method – Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers – Arithmetic Building Blocks – Adder – Subtractor.	12 hrs
Unit-3	Combinational Logic: Multiplexers – De-multiplexers – Decoders – Encoders – Code Converters – Parity Generators and Checkers.	12 hrs
Unit-4	Sequential Logic: RS, JK, D, and T Flip-Flops – Master-Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers.	12 hrs
Unit-5	Counters: Asynchronous and Synchronous Counters - Ripple, Mod, Up-Down Counters– Ring Counters. Memory: Basic Terms and Ideas –Types of ROMs – Types of RAMs.	12 hrs

Text Book

1. V.Rajaraman and T.Radhakrishnan, *Digital Computer Design*, Prentice Hall of India, 2001
2. D.P.Leach and A.P.Malvino, *Digital Principles and Applications* – TMH – Fifth Edition – 2002.
3. M. Moris Mano, *Digital Logic and Computer Design*, PHI, 2001.
4. T.C.Bartee, *Digital Computer Fundamentals*, 6th Edition, Tata McGraw Hill, 1991.

Lesson Plan:

Unit	Topics	Hrs	Mode
Unit I	Number Systems and Codes: Number System – Base Conversion	3	Chalk and talk, Quiz and assignment
	Binary Codes – Code Conversion.	2	
	Digital Logic: Logic Gates	2	
	Truth Tables	3	
	Universal Gates	2	
Unit II	Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions	2	Chalk and talk, Group discussion
	Using Theorems, K-Map, Prime – Implicant Method	3	
	Binary Arithmetic: Binary Addition – Subtraction	3	
	Various Representations of Binary Numbers	2	
	Arithmetic Building Blocks – Adder – Subtractor	2	
Unit III	Combinational Logic: Multiplexers – De-multiplexers	3	Chalk and talk, Quiz and assignment
	Decoders – Encoders	3	
	Code Converters	3	
	Parity Generators and Checkers	3	
Unit IV	Sequential Logic: RS, JK, D, and T Flip-Flops	3	PPT, Chalk and talk, Quiz and assignment
	Master-Slave Flip-Flops.	3	
	Registers: Shift Registers	3	
	Types of Shift Registers	3	
Unit V	Counters: Asynchronous and Synchronous Counters - Ripple,	2	PPT, Chalk and talk, Quiz and assignment
	Mod, Up-Down Counters	3	
	Ring Counters. Memory: Basic Terms and Ideas	3	
	Types of ROMs	2	
	Types of RAMs.	2	

COURSE LEARNING OUTCOMES:

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

		COURSE LEARNING OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CLO-1		Build simple logic circuits using basic gates and universal logic gates.	K3
CLO-2		Illustrate the basic idea about number systems and to learn conversion from one number system to another number system.	K3
CLO-3		Discuss about various data processing circuits.	K2,K3
CLO-4		Identify the operations and characteristics of clocks and timer circuits.	K4
CLO-5		Analyse and construct various flip-flops and counters.	K4

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	2	2	3	1	1
CLO-2	1	2	2	1	2	1
CLO-3	3	2	3	3	1	2
CLO-4	2	2	3	1	2	3
CLO-5	2	2	3	2	2	3

3- Advanced Application   2- Intermediate   1- Introductory

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Allied theory-1	20U1DAT1	Discrete mathematics	3	4	25	75	100

COURSE OBJECTIVES :

To familiarize the students about the concept and techniques of propositional logic , equivalences and their applications to logic theory. To study about Graph and Graph modules.

Units	Discrete mathematics --Course Contents	Total Hours: 60
Unit -I	Propositional Logic – Propositional equivalences-Predicates and quantifiers-Nested Quantifiers-Rules of inference-introduction to Proofs-Proof Methods and strategy	12 hrs
Unit-2	Mathematical inductions-Strong induction and well ordering-.The basics of counting-The pigeon hole principle –Permutations and combinations-Recurrence relations Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications	12 hrs
Unit-3	Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism -connectivity-Euler and Hamilton paths	12 hrs
Unit-4	Algebraic systems-Semi groups and monoids-Groups-Subgroups and Homomorphism's Cosets and Lagrange's theorem- Ring & Fields (Definitions and examples)	12 hrs
Unit-5	Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems –Sub lattices –direct product and Homomorphism-Some Special lattices Boolean Algebra	12 hrs

TEXT BOOKS:
1. Kenneth H.Rosen, "Discrete Mathematics and its Applications" ,Special Indian edition, Tata McGraw-Hill Pub. Co. Ltd., New Delhi,2011.
2. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30th edition2007.

REFERENCES:
1. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition,   Pearson Education Asia, Delhi, 2009.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2006.

Lesson Plan:

Unit	Topic	Hours	Mode
	Ice Breaking Session Expectations from the course will also be discussed	1	Activity: Getting to Know You The students will write down their expectations from the course and share it with the faculty Discussion on the course outline
I	Propositional Logic	1	Power Point PPT followed by classroom discussion
	Propositional Equivalences	1	Chalk and Talk
	Predicates and Quantifiers	2	Chalk and Talk followed by classwork activity involving problems
	Nested Quantifiers	1	Group presentation
	Rules of inference	2	Chalk and Talk followed by classwork activity
	Introduction to proofs	2	Chalk an Talk
	Proof Methods and Strategy	2	Power Point Presentation followed by classroom activity involving problems
II	Mathematical Inductions, Strong Induction and well ordering	2	Chalk and Talk followed by classroom activity of problem solving
	The Basics of Counting, The Pigeon Hole Principle	2	Chalk and Talk followed by classroom activity
	Permutations and Combinations	2	Group Presentation
	Recurrence Relations, Solving Linear Recurrence Relations	2	Chalk and Talk followed by individual classroom activity involving solving recurrence relations
	Generating Functions, Inclusion and Exclusion and Applications	4	Power Point Presentation followed by classroom activity involving solving problems
III	Graphs and Graph Models	2	Power point presentation followed by classroom Discussion
		1	Group Activity: Students will be divided into groups and each group will come up with a presentation on a graph model
	Graphs Terminology and Special Types of Graphs	2	Chalk and Talk followed by a Quiz
	Representing Graphs and Graph Isomorphism	3	Chalk and Talk
III		1	Classroom Debate: Students will be divided into groups and each group will come up with the pros and cons of each representation of graphs
	Euler and Hamilton Paths	3	Chalk and Talk followed by a Quiz
IV	Algebraic Systems, Semigroups and Monoids	3	Chalk and Talk followed by a Quiz
	Groups-Subgroups and Homomorphisms	3	Chalk and Talk followed by Group Assignment
	Cosets and Lagrange's Theorem	3	Power Point PPT followed by Discussion
	Ring and Fields	3	Chalk and Talk followed by classroom activity of problem solving
V	Partial Ordering, Posets	2	Chalk and Talk followed a Quiz
	Lattices as Posets, Properties of Lattices	3	Power Point PPT followed by Discussion
	Lattices as Algebraic Systems,	2	Chalk and Talk
	Sub-Lattices	1	Group Presentation
	Direct Product and Homomorphism	1	Chalk and Talk
	Some Special Lattices	1	Group Assignment: Students will be divided into groups and each group will be asked to do a presentation on one Special Lattices
	Boolean Algebra	2	Chalk and Talk followed by a Quiz

COURSE LEARNING OUTCOMES:

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

	COURSE LEARNING OUTCOME	**Knowledge Level (basis of Bloom's Taxonomy)**
CLO-1	Use And illustrate the concepts of proposition disjunction, conjunction and conditional statements and their use in problem solving.	K3
CLO-2	Explain and illustrate the concepts of mathematical induction and its use .	K3,K4
CLO-3	Explain and illustrate the algebraic systems, semi groups, monoids and homomorphism.	K3,K4
CLO-4	solve the concepts of lattices and Boolean algebra.	K3
CLO-5	Solve and explain the concepts of permutations and combinations and recurrence relations.	K4

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	2	2	1	1	1
CLO-2	1	3	1	1	2	1
CLO-3	3	2	3	1	1	2
CLO-4	2	2	3	1	2	3
CLO-5	3	2	3	3	2	3

3- Advanced Application   2- Intermediate   1- Introductory

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major core Practical-1	20U1DMP1	C programming Lab.	2	3	50	50	100

Course Objectives:

This practical course is designed to understand one of the structured programming language concepts and features and leads to develop programs.

C Lab – Practical List of programs:

I Summation of Series

1. Sin(x),   2. Cos(x),   3. Exp (x) (Comparison with built in functions)

II String Manipulation:

1. Counting the number of vowels, consonants, words, white spaces in a line of text and array of lines.
2. Reverse a string and check for palindrome.
3. Sub string detection, count and removal.
4. Finding and replacing substrings.

III Recursion

1. nPr, nCr
2. GCD of two numbers
3. Fibonacci sequence
4. Maximum & Minimum

IV Matrix Manipulation

1. Addition and Subtraction
2. Multiplication
3. Transpose, and trace of a matrix
4. Determinant of a Matrix

V Sorting and Searching

1. Insertion Sort
2. Bubble Sort
3. Linear Search
4. Binary Search

COURSE LEARNING OUTCOMES:
On the completion of the course the students will be able

	COURSE LEARNING OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CLO-1	Construct the logic using algorithms for a given problem and develop programs using conditional and control statements.	K4,k1
CLO-2	Develop programs with implementation of arrays and function.	K4
CLO-3	Construct programs string handling and memory related operations.	K4, k1
CLO-4	Compose programs with structures and unions.	K3, k4
CLO-5	Develop programs to perform file related operations	K4

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	2	1	2	1	1
CLO-2	1	3	2	1	2	1
CLO-3	3	2	2	1	1	2
CLO-4	2	2	2	1	2	3
CLO-5	3	2	3	2	2	3

3- Advanced Application   2- Intermediate   1- Introductory

I Year B.Sc. Computer Science
Semester-II

Sl.No.	Part	Category	Title of the paper	No of hours.	credits
1	I	Lang II	TAMIL / SANSKRIT / HINDHI	6	3
2	II	English II	ENGLISH - II	6	3
3	III	Major core theory -3	DATA STRUCTURES AND ALGORITHMS	4	3
4	III	Major core practical-2	PRACTICAL-2: DATA STRUCTURES USING C	3	2
5	III	Major core theory-4	COMPUTER ORGANIZATION & ARCHITECHTURE	4	3
6	III	Allied theory-2	MICROPROCESSORS 8086/88	4	3
7	IV	E & GS	ENVIRONMENTAL STUDIES	3	2
8		Extension		--	1
			TOTAL	**30**	**20**

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 3	20U2DMC3	Data structures and Algorithms	3	4	25	75	100

COURSE OBJECTIVES :

To introduce various data structures and their implementations and learn various sorting and searching algorithms.

Units	Data structures and algorithms --Course Contents	Total Hours: 60
Unit -I	Introduction of algorithms, analysing algorithms, Arrays : Representation of Arrays, Implementation of Stacks and queues, Application of Stack: Evaluation of Expression - Infix to postfix Conversion - Multiple stacks and Queues, Sparse Matrices.	12 hrs
Unit-2	Linked list : Singly Linked list - Linked stacks and queues - polynomial addition - More on linked Lists - Doubly linked List and Dynamic Storage Management - Garbage collection and compaction.	12 hrs
Unit-3	Trees: Basic Terminology - Binary Trees - Binary Tree representations - Binary trees - Traversal - More on Binary Trees - Threaded Binary trees - counting Binary trees. Graphs: Terminology and Representations - Traversals, connected components and spanning Trees, Single Source Shortest path problem.	12 hrs
Unit-4	Symbol Tables : Static Tree Tables - Dynamic Tree Tables - Hash Tables : Hashing Functions - overflow Handling. External sorting : Storage Devices - sorting with Disks : K-way merging - sorting with tapes.	12 hrs
Unit-5	Internal sorting : Insertion sort - Quick sort - 2 way Merge sort - Heap sort - shell sort - sorting on keys. Files: Files, Queries and sequential organizations - Index Techniques - File organization.	12 hrs

Text Books
1. Ellis Horowitz, Sartaj Shani, Data Structures, Galgotia publication.

Reference Books
1. Data structures Using C Aaron M. Tanenbaum, Yedidyah Langsam, Moshe J.Augenstein, Kindersley (India) Pvt. Ltd.,
2. Data structure and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D.Ullman, Pearson Education Pvt. Ltd.,

Lesson Plan:

Units	Topics	Hrs	Mode
Unit -I	Introduction of algorithms, analysing algorithms.	3	Chalk and Talk, Quiz and PPT
	Arrays : Representation of Arrays Implementation of Stacks and queues	3	
	Application of Stack: Evaluation of Expression - Infix to postfix Conversion	3	
	Multiple stacks and Queues, Sparse Matrices.	3	
Unit-2	Linked list : Singly Linked list .	2	Chalk and Talk, PPT and Assignment
	Linked stacks and queues - polynomial addition .	4	
	More on linked Lists - Doubly linked List and Dynamic Storage Management	3	
	Garbage collection and compaction.	3	
Unit-3	Trees: Basic Terminology - Binary Trees	2	Chalk and Talk, PPT and Group Discussion
	Binary Tree representations - Binary trees - Traversal	3	
	More on Binary Trees - Threaded Binary trees - counting Binary trees	3	
	Graphs: Terminology and Representations	2	
	Traversals, connected components and spanning Trees, Single Source Shortest path problem.	2	
Unit-4	Symbol Tables : Static Tree Tables -.	2	Chalk and Talk, PPT and Assignment
	Dynamic Tree Tables - Hash Tables :	3	
	Hashing Functions - overflow Handling	3	
	External sorting : Storage Devices - sorting with Disks : K-way merging - sorting with tapes.	4	
Unit-5	Internal sorting : Insertion sort - Quick sort	4	PPT, Chalk and Talk, and Quiz
	2 way Merge sort - Heap sort - shell sort – sorting on keys.	3	
	Files: Files, Queries and sequential organizations	3	
	Index Techniques - File organization.	2	

COURSE LEARNING OUTCOMES:

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

	COURSE LEARNING OUTCOME	**Knowledge Level (basis of Bloom's Taxonomy)**
CLO-1	Describe various algorithms and construction of Stack and Queue.	K1
CLO-2	Explain the concepts of Linked lists and construct the linked list related applications.	K4
CLO-3	Illustrate the ideas about binary trees, tree traversals and graphs.	K3
CLO-4	Describe the concepts related with symbol tables, hashing functions and storage devices.	K1, K3
CLO-5	Construct the algorithms for various sorting techniques and files with its various queries and indexing techniques.	K4

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	2	1	2	1	1
CLO-2	3	3	1	1	2	1
CLO-3	3	2	1	1	1	2
CLO-4	3	2	2	1	2	3
CLO-5	2	3	3	3	2	1

3- Advanced Application   2- Intermediate   1- Introductory

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 4	20U2DMC4	Computer Organisation and architecture	3	4	25	75	100

COURSE OBJECTIVES :

This course introduces the fundamental concepts of digital Computer organization and architecture.

To gain the basic knowledge of the building blocks of the computer system.

Units	Computer Organisation and architecture --Course Contents	Total Hours: 60
Unit -I	Basic of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers, Instruction Execution. Register Transfer and Micro operations: Register Transfer, Bus and Memory Transfers, Three-State Bus Buffers, Memory Transfer, Micro-Operations, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations.	12 hrs
Unit-2	Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation. Instruction Formats, Three- Address Instructions, Two – Address Instructions, One - Address Instructions, Zero - Address Instructions, RISC Instructions, Addressing Modes. RISC & CISC and their characteristics.	12 hrs
Unit-3	Addition And Subtraction With Signed-Magnitude, Multiplication Algorithm, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm, Hardware Algorithm, Divide Overflow, Floating-Point Arithmetic Operations, Decimal Arithmetic Operations, BCD Adder, BCD Subtraction.	12 hrs
Unit-4	Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU-IOP Communication. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory, Associative Memory.	12 hrs
Unit-5	Control memory – Address sequencing – Design of Control unit. Pipelining: Parallel Processing, Pipelining - Arithmetic Pipeline, Instruction Pipeline. Multiprocessors: Characteristics of Multiprocessors, Interconnection Structure: Time-Shared Common Bus, Multi-Port Memory, Crossbar Switch, Multistage Switching Network, Hypercube Interconnection.	12 hrs

TEXT BOOK:

1. "Computer System Architecture", M.Morris Mano. 4TH EDITION.

REFERENCE BOOK:

1. "Computer System Architecture", John. P. Hayes.
2. "Computer Organization, C. Hamacher, Z. Vranesic, S.Zaky.
3. "Computer Architecture and parallel Processing ", Hwang K. Briggs.

Lesson Plan:

Unit	Topics	Hrs	Mode
Unit I	Basic of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers,	3	Chalk and talk, Quiz and assignment
	Instruction Execution. Register Transfer and Micro operations: Register Transfer, Bus and Memory Transfers,	2	
	Three-State Bus Buffers, Memory Transfer, Micro-Operations,	2	
	Register Transfer Micro-Operations, Arithmetic Micro-Operations,	3	
	Logic Micro-Operations, Shift Micro-Operations.	2	
Unit II	Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation.	3	Chalk and talk, Group discussion
	Instruction Formats, Three- Address Instructions, Two – Address Instructions, One - Address Instructions, Zero - Address Instructions,	3	
	RISC Instructions, Addressing Modes.	3	
	RISC & CISC and their characteristics	3	
Unit III	Addition And Subtraction With Signed-Magnitude, Multiplication Algorithm,	3	Chalk and talk, Quiz and assignment
	Booth Multiplication Algorithm, Array Multiplier, Division Algorithm,	3	
	Hardware Algorithm, Divide Overflow, Floating-Point Arithmetic Operations	3	
	Decimal Arithmetic Operations, BCD Adder, BCD Subtraction.	3	
Unit IV	Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP),	3	PPT, Chalk and talk, Quiz and assignment
	CPU-IOP Communication. Memory Organization: Memory Hierarchy	3	
	Main Memory, Auxiliary Memory,	3	
	Cache Memory, Virtual Memory, Associative Memory.	3	
Unit V	Control memory – Address sequencing – Design of Control unit.	2	PPT, Chalk and talk, Quiz and assignment
	Pipelining: Parallel Processing, Pipelining - Arithmetic Pipeline, Instruction Pipeline	3	
	Multiprocessors: Characteristics of Multiprocessors, Interconnection Structure: Time-Shared Common Bus,	3	
	Multi-Port Memory, Crossbar Switch, Multistage Switching Network,	2	
	Hypercube Interconnection.	2	

COURSE LEARNING OUTCOMES:

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

	COURSE LEARNING OUTCOME	**Knowledge Level (basis of Bloom's Taxonomy)**
CLO-1	Design and simplify the combinational circuits using basic building blocks ,Boolean algebra and Karnaugh map.	K4
CLO-2	Explain the organization of basic computer, control units and its design.	K4,K3
CLO-3	Describe the working of CPU.	K1
CLO-4	Describe the operation of registers, micro-instructions and Input /Output units.	K1
CLO-5	Explain the organization of memory and memory related operations and advanced computer architectures.	K4

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	2	1	2	1	1
CLO-2	3	3	1	1	1	1
CLO-3	3	2	1	1	1	2
CLO-4	3	2	2	1	2	1
CLO-5	3	2	3	3	2	1

3- Advanced Application   2- Intermediate   1- Introductory

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Allied theory - 2	20U2DAC2	Microprocessors 8086 / 88	3	4	25	75	100

COURSE OBJECTIVES:

To provide a theoretical & practical introduction to microcomputer and microprocessors, assembly language programming techniques, design of hardware interfacing circuit.

Units	Microprocessors 8086 / 88 --Course Contents	Total Hours: 60
Unit -I	Internal architecture – Software model- data types – segment registers- data registers- pointers and index Registers- status registers – generating a memory address – addressing mode.	12 hrs
Unit-2	The instruction set – data transfer instructions- arithmetic instructions – logic Instructions- shift instructions- rotate instructions- compare instructions- jump Instructions – the loop and loop handling instructions – string and string handling Instructions.	12 hrs
Unit-3	Minimum –mode and maximum-mode systems minimum system mode interface- system Clock – bus cycle – control signals – read and write bus cycles – memory interface Circuits.	12 hrs
Unit-4	Minimum-mode interface- maximum-mode interface- I/O data transfers- I/O instructions- Eight byte wide output ports with isolated I/O – eight byte wide input port using isolated I/o.	12 hrs
Unit-5	Types of interrupts – interrupt instructions- enabling/disabling of interrupt – external Hardware interrupt interface – block diagram of the 8249a (interrupt controller) – Software interrupts.	12 hrs

Text Book:

1. Walter A. Triebel, Avtar Sing - "The 8088 and 8086 microprocessors (programming, interfacing, software, hardware and Applications) " – Prentice Hall Of India, Edition - 1995.

Reference Books:

1. Douglas v.hall – "Microprocessor and interfacing"– McGraw-Hill.
2. Bary Brey – "Introduction to Microprocessor and Microcomputer"- PHI.

Lesson Plan:

Unit	Topics	Hrs	Mode
Unit I	Internal architecture – Software model	3	Chalk and talk, Quiz and assignment
	Data types – Segment registers	2	
	Data registers- Pointers and index Registers	2	
	Status registers – Generating a memory address	3	
	Addressing mode	2	
Unit II	The instruction set – Data transfer instructions	2	Chalk and talk, Group discussion
	Arithmetic instructions – Logic Instructions-	3	
	Shift instructions- Rotate instructions	3	
	Compare instructions- Jump Instructions –	2	
	The loops and loop handling instructions – Strings and string handling Instructions	2	
Unit III	Minimum-mode and Maximum-mode systems	2	Chalk and talk, Quiz and assignment
	Minimum system mode interface signals	2	
	System Clock – Bus cycle	3	
	Control signals	2	
	Read and write bus cycles – Memory interface Circuits	3	
Unit IV	Minimum-mode interface	2	PPT, Chalk and talk, Quiz and assignment
	Maximum-mode interface	2	
	I/O data transfers- I/O instructions	2	
	Eight byte wide output ports with isolated I/O	3	
	eight byte wide input port using isolated I/O	3	
Unit V	Types of interrupts	2	PPT, Chalk and talk, Quiz and assignment
	Interrupt instructions- enabling/disabling of interrupt	3	
	External Hardware interrupt interface	3	
	Block diagram of the 82C49A (interrupt controller)	2	
	Software interrupts	2	

COURSE LEARNING OUTCOMES:

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

	COURSE LEARNING OUTCOME	**Knowledge Level (basis of Bloom's Taxonomy)**
CLO-1	Illustrate the basic idea about internal architecture of the microprocessor.	K3
CLO-2	Identify the instruction sets and operations of arithmetic , relational and conditional statements.	K1, K4
CLO-3	Discuss about the interface cycles with read ,write and fetch cycles.	K2
CLO-4	Identify the instructions about data transfer between I / O blocks.	K4
CLO-5	Discuss about an interrupt , its types, hardware and software interrupts.	K2

MAPPING OF CLOs WITH PSOs:

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	1	1	2	1	1
CLO-2	2	3	2	1	1	1
CLO-3	2	3	1	1	1	2
CLO-4	3	2	2	1	2	1
CLO-5	2	2	2	3	2	1

3- Advanced Application 2- Intermediate 1- Introductory

DEPARTMENT OF COMPUTER SCIENCE				CLASS: I B.Sc. Computer Science				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major core practical-2	20U2DMP2	Data structures lab using C	3	3	50	50	100

COURSE OBJECTIVES:

To develop skills to design and analyse simple linear and non-linear data structure.

To understand the practical applications of Data structures.

List of Programmes.

1. Write a C program to create two array list of integers. Sort and store the elements of both of them in third list.
2. Write a C program to multiply two matrices A and B and store the resultant matrix in C using arrays.
3. Write a C program to experiment the operation of STACK using array.
4. Write a C program to create menu driven options to implement QUEUE to perform the following
   (i) Insertion (ii) Deletion (iii) Modification (iv) Listing of elements
5. Write a C program to create Linked list representations of employee records and do the following operations using pointers.
   (i) To add a new record.
   (ii) To delete an existing record.
   (iii) To print the details about an employee.
   (iv) To find the number of employees in the structure.
6. Write a C Program to count the total nodes of the linked list.
7. Write a C program to insert an element at the end of the linked list.
8. Write a C program to insert an element at the beginning of a doubly linked list.
9. Write a C program to display the hash table, using the mid square method.
10. Write a program to demonstrate Binary Search.
11. Write a C program to insert nodes into a Binary tree and to traverse in pre order.

COURSE LEARNING OUTCOMES:

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

Course Learning Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CLO-1	3	1	2	1	1	1
CLO-2	2	3	2	1	1	1
CLO-3	2	2	2	1	1	2
CLO-4	2	2	2	1	1	1
CLO-5	2	1	2	3	2	1

MAPPING OF CLOs WITH PSOs:

	COURSE LEARNING OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CLO-1	Construct programs to sort numbers and strings and searching the elements using sequential and binary search.	K3
CLO-2	Describe and Design programs with recursion and pointers related applications.	K1, K4
CLO-3	Construct programs on stack and queue and explain its operations.	K4
CLO-4	Construct and explain about linked list data structure and its operations.	K4,k3
CLO-5	Design programs on binary trees and tree traversals.	K3

3- Advanced Application   2- Intermediate   1- Introductory

DEPARTMENT OF COMPUTER SCIENCE
THE MADURA COLLEGE (AUTONOMOUS) , MADURAI-11.

<u>CERTIFICATE COURSE</u>

DESCRIPTION:

        This is an introductory course that provides a basic understanding of desktop publishing . DTP is a software of publishing used to create high quality printed material for all individuals, businesses as well as organizations. The DTP software provides very good control over the designing and layout of a page as compared to the word processor. The role of the DTP operator is to bring the required information in the most comprehensive and understandable manner. Also, they bring the required information in the most comprehensive and understandable manner before consumers consume something. DTP is a type of profession, presentation of the information is completely related to the performance of the organization. Thus there is a great scope of these professionals not only now but in the future also.

Objectives:
- ❖ To give a basic understanding on the most comprehensive application tools like Photoshop and flash.
- ❖ To provide hands-on training on Adobe-Photoshop, flash applications knowledge and skills.
- ❖ To impart the practical skills on the creation of various DTP related business work with case studies.

Course Scope:

There are a number of opportunities available in various fields after completing DTP course. Some fields available which give career option after completing this course.
- ▪ Newspaper
- ▪ Software Companies
- ▪ Magazines
- ▪ Advertising

Eligibility criteria:

        Open to all major students with minimum knowledge of basic computer operation. Preference will be given to final year students of UG and PG.

Minimum number of students per batch: 30 nos.

Course duration	**: 30 hrs.**
Timing	**: After college working hours.**
Max marks	**: 100 marks**

Certificates will be given to the students after the completion of course.

DEPARTMENT OF COMPUTER SCIENCE				Certificate Course			
Course Type	Course Code	Course Code Course Title	Credits	Total Contact Hours	CIA	Ext	Total
Value Added Course		Desktop publishing (DTP)	2	30			

Learning objectives:

- ➢ To gain knowledge and exposure on desktop publishing works.
- ➢ To understand both theoretical and practical knowledge on various tools used in DTP
- ➢ To be able to show the creative skills in DTP work.

Learning outcomes:

Comprehensive knowledge on creativity in desktop publishing work. Ability to show the creative idea using DTP tools.

Syllabus:

Unit-1: introduction :Getting started –work with images-understanding photoshop-workspace-find your projects-set preferences-save work spaces-open an image-filter images-import images –create a new image.Understanding photoshop images: toolbox-work with tool box-magnify with zoom tool-adjust views-change screen modes-rulers and guides-undo commands-revert an image-manage windows.

Unit-2: changing size of an image-change print size-changing resolution of an image-crop and straighten photos trim an image-changing canvas size of the image. Making selections: marquee tool-lasso tool-quick selection tool-magic wand tool- color range command-select all the pixels in an image-move a selection boarder-invert selection-grow selection- create slices.

Unit-3: working with layers: create and add layers-hide-move-duplicate and delete layers-merge, rename and transform layers-create solid fill layer-create and edit adjustment layer-link layers-add , edit layer –mask. Applying filters: applying filter styles.

Unit-4: Flash – introduction: getting started with flash cs5-creating a project plan -building a flash project-creating new document-working with document windows-saving a document-working with flash environment: working with layers- organizing layers-changing layer properties-working with frames and scenes- using edit bar-using the main tool bar-resizing panels – setting text preferences-working with pagesetup in windows.

Unit-5: creating graphics: working with object drawing-drawing with the line tool-pencil tool-drawing shapes-creating groups -arranging multiple groups- creating symbols-edit symbol mode-working with text: creating TLF text- changing font type,style,size and color-changing text alignment-creating text cloumns-text direction -using font mapping-importing multiple files. Motion tweening -tweening properties.

Text book:

1. Teach yourself Adobe Photoshop CS6 by Mike Wooldridge and Brianna stuart, wiley publication.
2. Adobe Flash professional CS5 on demand. By steve johnson . Perspection Inc.

Department of Information Technology

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Academic Year 2020-2021 onwards

THE MADURA COLLEGE (AUTONOMOUS), MADURAI-11
(Self Financing Stream)

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To serve the society by producing the disciplined, skilled intellectual and ethical IT professionals with potential to face the changes and challenges of the modern computing industry.

MISSION

- To provide the strong academic foundation in theories and practical of Information Technology.
- To enhance the students knowledge in the latest technologies by organizing and participating in technical programs.
- To encourage the students to deliver their innovative designs and become the successful IT professionals.

Programme Educational Objectives (PEOs): B.Sc. Information Technology

After successful programme, the students will be able to

PEO 1	Apply the knowledge of Mathematics, Science and fundamentals to the solution of problems with different applications.
PEO 2	Identify, formulate, research literature, and analyze various application problems reaching substantiate conclusions using prime principles of information technologies.
PEO 3	Design system responds or processes that meet the specified needs with appropriate consideration for the public health and safety, and the societal, and environmental considerations.
PEO 4	Create, select and apply appropriate techniques, resources, and modern tools including prediction and formulation of various outcomes.
PEO 5	Apply principles and commit to professional ethics, responsibilities and norms of the scientific and sustainable development.
PEO 6	Perform effectively as an individual, a member or leader in diverse teams and in multidisciplinary environments.

Programme Outcomes for B.Sc. Graduates

At the end of the Programme, the Graduates will be able to

PO1	Integrate learned skills and knowledge derived from the study of the science and other related disciplines, acquiring the necessary depth and breadth required for the transdisciplinary perspective.
PO2	Demonstrate proficiency in using disciplinary appropriate methods for research, critical analysis or creative work and provide scientific solution to the problems of the society.
PO3	Communicate conclusion, interpretation and implication clearly, concisely, effectively both orally and in writing for different types of audiences.
PO4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and ways of mitigating them.
PO5	Use modern tools, resources and software and be abreast with the emerging trends in their disciplinary area and practice lifelong learning.

Programme Specific Outcomes (PSOs): B.Sc. Information Technology

At the end of the Programme, the students will be able to

PSO	GRADUATE ATTRIBUTES	DESCRIPTION
PSO-1	Knowledge in core competency	Acquire fundamental concepts, methods and practices of Information Technology to develop theoretical and practical skill sets.
PSO-2	Problem analysis & Modern tool usage	Justify the optimum technique to allocate memory resources, processors, I/O peripherals to provide optimal programmatic solution to a real-time problem.
PSO-3	Design and development of solutions for complex problems	Develop practical skills to provide solutions for computer-oriented problems.
PSO-4	Knowledge in core competency & Problem analysis	Recognize the generalized and distinguished the characters of different Hardware and Software Systems for different environments.
PSO-5	Environment and sustainability	Efficiently integrate IT based solution into user friendly environments.
PSO-6	Lifelong Learning & Modern tool usage	Gain skills on basic as well as trendy software languages and packages to design software systems.

Qualification for Admission

Candidates should have passed the Higher Secondary Examination with Physics and Mathematics, conducted by the Board of Higher Secondary Education, Government of Tamil Nadu, CBSE & ICSE or any other examinations approved by Madurai Kamaraj University as equivalent.

Duration of the Course

The students shall undergo prescribed course of study for the period of three academic years under CBCS semester pattern with outcome based education model.

Medium of Instruction: English

System: Choice Based Credit System with Outcome Based Education Model

EVALUATION (THEORY)

Internal (Formative)	: 25 marks
External (Summative)	: 75 marks
Total	: 100 marks

Continuous Internal Assessment: 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted to 10 marks)	10
Assignment	5
Quiz/ Seminars/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

BLUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO 1	Up to K3	2	K1& K2	1	K1	2 (K2&K2)	2(K2&K3)	
2	CLO 2	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems.

K4- Examining, analyzing, presentation and make inferences with evidences.

BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO 3	Up to K3	2	K1& K2	1	K1	2 (K2&K2)	2(K2&K3)	
2	CLO 4	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems.

K4- Examining, analyzing, presentation and make inferences with evidences.

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	4	6.67	50
K2	2	4	10	10	26	43.33	
K3	-	-	10	10	20	33.33	33
K4	-	-	-	10	10	16.67	17
Total Marks	4	6	20	30	60	100.00	100%

- CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions (10 X 1 marks)	10
B- Short answer type (5 X 2 marks)	10
C- Either/Or type (5 X 5 marks)	25
D- Open Choice type (3 out of 5 X 10 marks)	30
Total	75

EVALUATION (PRACTICAL)

Internal (Formative)   : 40 marks
External (Summative)   : 60 marks
Total   : 100 marks

Question Paper Pattern for Practical Examination: 50 Marks

Internal			External	
Components	**Marks**		**Components**	**Marks**
Major Question	20		Major Question	30
Minor Question	10		Major Question	20
Record work	5		Record work	5
Program Explanation /VIVA	5		Program Explanation /VIVA	5
Total	40		Total	60

- In respect of external examinations, passing minimum is 35% for Under Graduate Courses and in total, aggregate of 40%.

The Madura College (Autonomous – Self Finance), Madurai-625011
Department of Information Technology

Curriculum structure for B.Sc. Information Technology
(with Mathematics & Commerce ancillaries)

Semester	Course Type	Subject Code	Course title	Contact hours/ week	Credits
I	Part -I : Lang-I	20U1T/S/HLA1	Tamil-I/Sanskrit-I/Hindi-I	6	3
	Part - II : English –I	20U1NEN1	English –I	6	3
	VE &PE	20U1VEN1	Value Education & Professional Ethics	3	3
	Part III: Allied –I / I	20U1FAC1	Discrete Mathematics	6	5
	Major Core -1	20U1FMC1	C Programming	3	2
	Major Core- 2	20U1FMC2	Principles of Information Technology	3	2
	Major Core Practical-1	20U1FMP1	C Programming – Lab	3	2
	Total			30	20
II	Part - I : Lang-II	20U2T/S/HLA2	Tamil-II/Sanskrit-II/Hindi-II	6	3
	Part - II : English-II	20U2NEN2	English-II	6	3
	E & G S	20U2EVS1	Environment & Gender studies	3	3
	Part III :Allied-I / II	20U2FAC2	Resource Management Techniques	6	5
	Major Core -3	20U2FMC3	Object Oriented Programming with C++	3	2
	Major Core- 4	20U2FMC4	Digital Principles and Applications	3	2
	Major Core Practical-2	20U2FMP2	OOPs with C++ - Lab	3	3
	Extension Activities			--	1
	Total			30	22
III	Part -I : Lang-III	20U3T/S/HLA3	Tamil-III/Sanskrit-III/Hindi-III	6	3
	Part - II : English-III	20U3NEN3	English-III	6	3
	Non Major Elective –I (NME- I)	20U3FNM1	PC Software	2	2
	Skill based Elective –I	20U3FSM1	Office Automation – Lab	2	2
	Part III: Allied-II /I	20U3FAC3	Financial Accounting	6	5
	Major Core -5	20U3FMC5	Data Structures and Algorithms	5	3
	Major Core Practical-3	20U3FMP3	Data Structures and Algorithms – Lab	3	2
	Total			30	20

IV	Part- I : Lang –IV	20U4T/S/HLA4	Tamil-IV/Sanskrit-IV/Hindi-IV	6	3
	Part - II : English-IV	20U4NEN4	English-IV	6	3
	Non-Major Elective – II	20U4FNM2	Introduction to Internet	2	2
	Skill Based Elective –II	20U4FSM2	Networking Lab in Java	2	2
	Part III: Allied –II / II	20U4FAC4	Business Statistics	6	5
	Major Core -6	20U4FMC6	Java Programming	5	3
	Major Core Practical-4	20U4FMP4	Java Programming – Lab	3	2
	Total			30	20
V	Skill Based Elective-III	20U5FSM3	Major Elective I – Lab	2	2
	Major Core -7	20U5FMC7	Dot Net Technologies	5	5
	Major Core- 8	20U5FMC8	Relational Database Management System	5	5
	Major Core -9	20U5FMC9	Data Communication and Computer Network	5	5
	Major Core Practical-5	20U5FMP5	Dot Net Technologies – Lab	3	3
	Major Core Practical-6	20U5FMP6	RDBMS – Lab	3	3
	Major Elective –I	20U5FME1	Computer Graphics / Microprocessor / Linux Programming / Multimedia Technologies	4	3
	Major Elective –II	20U5FME2	Compiler Design / Client-Server Computing / E-Commerce / Digital Image Processing	3	3
	Total			30	29
VI	Skill Based Elective -IV	20U6FSM4	Major Elective III – Lab	2	2
	Major Core -10	20U6FMC10	Programming in PHP	5	5
	Major Core- 11	20U6FMC11	Operating System	5	5
	Major Core -12	20U6FMC12	Software Engineering	5	5
	Major Core Practical-7	20U6FMP7	Programming in PHP – Lab	3	3
	Major Core Practical-8	20U6FMP8	Project & Viva-voce – Lab	3	3
	Major Elective –III	20U6FME3	Web Technologies / Python Programming / Android Programming / Block chain Technologies	4	3
	Major Elective –IV	20U6FME4	Data Mining / Network Security / Mobile Computing / Cloud Computing	3	3
	Total			30	29

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Allied - 1	20U1FAC1	Discrete Mathematics	5	6	25	75	100

Course Objectives:
1. To acquire knowledge on Discrete Structure and apply Boolean laws.
2. To illustrate the use of relations and comparing various functions.
3. To understand and apply inductions and finding solutions for finite order relations.
4. To elucidate the significance of matrices.
5. To apply the laws & and rules used in logic in various applications.

Unit-I: Set Theory
Introduction – Sets - Notation and Description of Sets – Subsets - Venn-Euler Diagrams - operations on sets - Properties of set operations - verification of the Basic Laws of Algebra by Venn diagram - The principle of Duality.

Unit-II: Relations
Cartesian product of two sets - Relations - Representation of Relations - operations on Relations - Equivalence Relation. Functions and Operators - one-to-one, onto functions - Special types of functions - invertible functions - composition of functions.

Unit-III: Mathematical Induction
Techniques of Proof - Mathematical induction Recurrence Relation and Generating Functions: Recurrence – An introduction - Polynomials and their evaluations - Recurrence Relations - Solution of finite order Homogeneous Relations - Solution of finite order Non-Homogeneous Relations - Generating Functions.

Unit-IV: Matrix Algebra
Introduction - Matrix Operations - Inverse of a square matrix - Elementary operations and Rank of a matrix - Simultaneous equations - Eigen Values and Eigen Vectors.

Unit-V: Logic
Introduction - TF Statements – Connectives - Atomic and Compound statements - Well Formed Formulae - Truth table of a formula – Tautology - Tautological implications and equivalence of formulae - Lattices - Some properties of Lattices.

Books for Study

1. Dr. M.K.Venkatraman, Dr.N.Sridharan, N.Chandrasekaran – "Discrete Mathematics" - The National Publishing Company - 2003.
   Chapters:
   Unit – I : 1.
   Unit – II : 2.1-2.5, 3.
   Unit – III: 4, 5.1-5.6.
   Unit – IV : 6.1 -6.5, 6.7.
   Unit – V : 9.1 -9.8,10.1 – 10.2.

Books for Reference

1. Alan Doerr,Levassure – "Applied Discrete Mathematical Structures for Computer Science".
2. Trembly and Manohar – "Discrete Mathematical Structures with Application to Computer Science".

Web Resources

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf
2. http://home.iitk.ac.in/~arlal/book/mth202.pdf

Pedagogy

Chalk and talk, Materials, Assignment, Seminar, Problem solving, Group discussion, and Interaction.

Course Learning Outcomes:

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

CLO No.	Course Learning Outcomes	K - Level
CLO1	List various laws of Set theory. Apply the laws and properties to simplify the problems. Discuss the duality principle and solve the problems.	Up To K3
CLO2	Describe the representations of relations. Illustrate the usage of equivalence relations in real world problems. Outline different types of functions.	Up To K3
CLO3	Explain Mathematical induction and recurrence relations. Classify the finite order relations.	Up To K4
CLO4	Outline the operations on matrices. Solve simultaneous linear equations. Find the Eigen values and Eigen vectors.	Up To K3
CLO5	Relate Atomic and Compound statements of Logic. Identify the relationship between WFF and Tautology. Explain Lattices and its properties.	Up To K4

Mapping of CLOs with POs:

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	1	1	3
CLO2	3	3	N/A	N/A	2
CLO3	3	3	N/A	N/A	2
CLO4	3	1	N/A	N/A	3
CLO5	3	2	1	1	3

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSOs:

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	2	3	2	2	N/A
CLO2	3	N/A	1	N/A	N/A	N/A
CLO3	1	1	2	N/A	1	N/A
CLO4	2	2	2	N/A	2	N/A
CLO5	3	3	3	2	3	1

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination – Discrete Mathematics
Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K - Level	Section A MCQs		Section B Short Answers		Section C (Either/ or Choice)	Section D (Open Choice)
			No. of Questions	K - Level	No. of Questions	K - Level		
1	CLO 1	Up to K 3	2	K1 & K2	1	K1	2(K1 & K1)	1(K3)
2	CLO 2	Up to K 3	2	K1 & K3	1	K3	2(K3 & K3)	1(K2)
3	CLO 3	Up to K 4	2	K1 & K2	1	K1	2(K2 & K2)	1(K4)
4	CLO 4	Up to K 3	2	K1 & K2	1	K2	2(K3 & K3)	1(K1)
5	CLO 5	Up to K 4	2	K1 & K3	1	K3	2(K4 & K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	10	29	24.17	45%
K2	3	2	10	10	25	20.83	
K3	2	4	20	20	46	38.33	38%
K4	-	-	10	10	20	16.67	17%
Total Marks	10	10	50	50	120	100.00	100%

Lesson Plan:

Units	Topics to be Covered	Hours	Mode
I	Introduction – Sets - Notation and Description of Sets – Subsets - Venn-Euler Diagrams	6	Lecture
	operations on sets - Properties of set operations	5	Lecture
	Verification of the Basic Laws of Algebra by Venn diagram - The principle of Duality.	7	Lecture & GD
II	Cartesian product of two sets - Relations - Representation of Relations - operations on Relations	6	Lecture
	Equivalence Relation. Functions and Operators - one-to-one, onto functions	5	Lecture
	Special types of functions - invertible functions - composition of functions.	7	Lecture
III	Techniques of Proof - Mathematical induction, Polynomials and their evaluations.	6	Lecture
	Recurrence Relations - Solution of finite order Homogeneous Relations	6	Lecture
	Solution of finite order Non-Homogeneous Relations - Generating Functions.	6	Lecture
IV	Introduction - Matrix Operations	5	Lecture, PPT
	Inverse of a square matrix - Elementary operations and Rank of a matrix	6	Lecture, GD
	Simultaneous equations - Eigen Values and Eigen Vectors	7	Lecture, GD
V	Introduction - TF Statements – Connectives	5	Lecture
	Atomic and Compound statements - Well Formed Formulae - Truth table of a formula – Tautology	7	Lecture, GD
	Tautological implications and equivalence of formulae - Lattices - Some properties of Lattices.	6	Lecture, Assignment

Name of the Course Designers:
1. Mrs. S. Rajalakshmi
2. Mrs. R. Tamilselvi

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core-1	20U1FMC1	C Programming	2	3	25	75	100

Course Objectives:

1. To acquire knowledge on the basis of C programming and train them to develop user friendly application code using C.
2. To familiarize the concept of Decision making and looping.
3. To understand the concepts of Arrays its declaration and uses.
4. Be familiar with programming environment with C programming structure.
5. To learn the concept of file structure and pointers used in code development.

Unit-I: Overview of C History of C – Basic Structure of C Programs – C Tokens – Keywords and Identifiers – Constants, Variables and Data Types – Declaration of Variables – Operators and Expressions: Arithmetic, relational, logical, assignment operators – increment and decrement operators, conditional operators, bitwise operators, special operators – Arithmetic Expressions- Evaluation of Expressions.

Unit-II: Managing I/O Operations Reading and Writing a Character – Formatted Input, Output – Decision Making & Branching: if statement - if else statement - nesting of if else statements - else if ladder – switch statement – the ?: operator – the while statement – do statement – the for statement.

Unit-III: Arrays
One-Dimensional Arrays – Declaration, Initialization – Two-Dimensional Arrays – Multi-dimensional Arrays. Strings: Declaration, Initialization of string variables – reading and writing strings – string handling functions.

Unit-IV: User-defined functions and Structures Elements of user defined functions – function calls– all types of arguments and return values – nesting of functions – scope visibility and life time of variables. Structures and Unions: Defining a structure – declaring a structure variable – accessing structure members – initialization – copying and comparing – operation on individual members – unions.

Unit-V: Pointers and Files Accessing the address of a variable – declaring, initialization of pointer variables – accessing a variable through its pointer – pointers as function arguments – pointers and structures. Files: Defining, opening, closing a file – IO Operations on files – Error handling during IO operations – command line arguments.

Books for Study

1. E.Balagurusamy, Programming in ANSI C, 7th Edition,2007, Tata McGraw Hill Publishers.

   Chapters:
   Unit I: 1, 2, 3.
   Unit II: 4, 5, 6.
   Unit III: 7, 8.
   Unit IV: 9, 10.
   Unit V: 11, 12.

Books for Reference

1. Gottfried , Programming with C, Schaum's Outline Series, , 2006,Tata McGraw Hill.
2. Ashok N.Kamthane , Programming with ANSI and Turbo C , 2006, Pearson Education.
3. Kanetkar Y., Let us C, 1999, BPB Pub., New Delhi.

Web Resources

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.programiz.com/c-programming/
3. https://www.geeksforgeeks.org/c-language-set-1-introduction/

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Learning Outcomes:

On the completion of the course the student will be able to

CLO No.	Course Learning Outcomes	K – Level
CLO1	Demonstrate the types of variables ,Constants, data types, operators, Expressions	Up To K2
CLO2	Examine the concept of Looping and Conditional statements for developing the code.	Up To K4
CLO3	Implement the various types of Arrays and operations related with strings	Up To K3
CLO4	Develop the code for various types of user defined functions and the scope of visibility lifetime variables and apply Structures and Unions for complicated problems	Up To K3
CLO5	Describe about the Pointers and the impact of address of pointers used in code development, Explain the usage of File concepts in C coding	Up To K4

Mapping of CLOs with POs:

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	1	1	3
CLO2	3	3	N/A	N/A	3
CLO3	3	2	N/A	N/A	3
CLO4	2	2	N/A	N/A	2
CLO5	2	2	N/A	N/A	2

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSO:

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	1	2	1	2	2
CLO2	3	1	3	1	3	2
CLO3	2	3	3	N/A	1	2
CLO4	3	2	3	N/A	1	2
CLO5	2	3	3	N/A	3	1

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - C Programming
Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

S.NO	CLOs	K- Level	Section A MCQs No Of Questions	Section A MCQs K - Level	Section B Short Answers No Of Questions	Section B Short Answers K – Level	Section C (Either/or Choice)	Section D (Open Choice)
1	CLO1	Up to K2	2	K1 & K2	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K4	2	K1 & K2	1	K1	2(K3&K3)	1(K4)
3	CLO3	Up to K3	2	K1 & K2	1	K2	2(K2&K2)	1(K3)
4	CLO4	Up to K3	2	K1 & K2	1	K2	2(K3&K3)	1(K3)
5	CLO5	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Level	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	20	40	33.33	33%
K4	-	-	10	20	30	25	25%
Total Marks	10	10	50	50	120	100	100%

Lesson Plan:

Units	Topics to be Covered	Hours	Mode
I	History of C – Basic Structure of C Programs – C Tokens – Keywords and Identifiers – Constants, Variables and Data Types – Declaration of Variables.	3	Lecture
	Operators and Expressions: Arithmetic, relational, logical, assignment operators – increment and decrement operators, conditional operators, bitwise operators, special operators.	4	Lecture & GD
	Arithmetic Expressions- Evaluation of Expressions.	2	Lecture & GD
II	Reading and Writing a Character – Formatted Input, Output.	3	Lecture
	Decision Making & Branching: if statement - if else statement - nesting of if else statements - else if ladder.	3	Lecture
	switch statement – the ?: operator – the while statement – do statement – the for statement – go to statement.	3	Lecture
III	One-Dimensional Arrays – Declaration, Initialization – Two-Dimensional Arrays – Multi-dimensional Arrays.	5	Lecture
	Strings: Declaration, Initialization of string variables – reading and writing strings – string handling functions.	4	Lecture
IV	Elements of user defined functions – function calls– all types of arguments and return values – nesting of functions – scope visibility and life time of variables.	4	Lecture
	Structures and Unions: Defining a structure – declaring a structure variable – accessing structure members – initialization – copying and comparing – operation on individual members – unions.	5	Lecture
V	Accessing the address of a variable – declaring, initialization of pointer variables – accessing a variable through its pointer – pointers as function arguments – pointers and structures.	5	Lecture
	Files: Defining, opening, closing a file – IO Operations on files – Error handling during IO operations – command line arguments.	4	Lecture, Assignment

Name of the Course Designers:
1. Mrs. K. Imaya
2. Mrs. R. Lakshapriya

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core-2	20U1FMC2	Principles of Information Technology	2	3	25	75	100

Course Objectives:
1. To acquire the knowledge of fundamentals of Computer Systems.
2. To study the concepts of computer architecture and various Input / Output devices.
3. To demonstrate the Computer Software and Software development
4. To learn the concepts of Computer Networks and WWW.
5. Use Multimedia techniques in various areas.

Unit-I: Introduction
Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.

Unit-II: Hardware
Architecture of Computer - CPU and Memory - Secondary Story Devices - Input Devices - Output Devices.

Unit-III:Software
Introduction to Computer Software - Programming Language - Operating Systems - Introduction to Database Management System.

Unit-IV: Networks
Computer Networks - WWW and Internet - Email - Intranets - Mobile Computing and Business on the Internet.

Unit-V: Multimedia and Security
Introduction to Multimedia - Multimedia Applications - Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.
.
Books for Study
1. Alexis Leon And Mathews Leon, Fundamentals of Information Technology, Vikas Publishing House Pvt. Ltd, 2009.

Chapters:
Unit I: Chapters1 -4.
Unit II: Chapters 5, 7-10.
Unit III: Chapters 11,13,14,16.
Unit IV: Chapters 21, 24-26, 49.
Unit V: Chapters: 33, 34, 46-48, 30, 32.

Books for Reference

1. Dennis P. Curtin ,Kim foley, KunalSen and Cathleen Morin, Information Technology – The Breaking Wave, Tata-McGraw Hill Publications, 2005.
2. Principle of Information Technology by Kathleen M. Austin and Lorraine N. Bergk.

Web Resources

1. http://www.itdesk.info/Basic Concepts of Information Technology notes.pdf
2. https://www.academia.edu/34887670/Unit_1_-Information_Technology_Notes

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Group discussion, Interaction and Projectors.

Course Learning Outcomes:

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

CLO No.	Course Learning Outcome	K - Level
CLO1	Describe the generation of computer and digital computer systems.	Up To K2
CLO2	Explain the basics of CPU and memory and different types of storage, Input/output devices.	Up To K4
CLO3	Illustrate the computer Software and database management systems.	Up To K3
CLO4	Classify the concepts of Computer Network.	Up To K3
CLO5	Explain Multimedia applications.	Up To K4

Mapping of CLOs with POs:

CLOs / POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	1	1	3
CLO2	3	1	N/A	N/A	2
CLO3	2	3	N/A	N/A	3
CLO4	3	2	N/A	N/A	2
CLO5	2	3	1	2	3

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSOs:

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	3	1	1	3	N/A
CLO2	3	3	3	3	3	2
CLO3	3	2	2	2	3	2
CLO4	3	3	2	3	2	1
CLO5	3	2	3	3	2	2

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Principles of Information Technology
Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl.No	CLOs	K - Level	Section A MCQs		Section B Short Answer		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No.of Questions	K - Level		
1	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1 & K1)	1(K2)
2	CLO 2	Up to K 4	2	K1 & K2	1	K2	2 (K2 & K2)	1(K4)
3	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3& K3)	1(K3)
4	CLO 4	Up to K 3	2	K1 & K2	1	K3	2 (K3 & K3)	1(K3)
5	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K3 & K3)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining analyzing , presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K – Level	Section A (No Choice)	Section B (No Choice)	Section C (Either / or Choice)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	2	10	-	17	14.16	40 %
K2	5	6	10	10	31	25.83	
K3	-	2	30	20	52	43.33	43.33%
K4	-	-	-	20	20	16.66	16.66 %
Total Marks	10	10	50	50	120	100.00	100 %

Lesson Plan:

Units	Topics to be Covered	Hours	Mode
I	Introduction to computer systems, five generation of modern computers	4	Lecture
	Classification of digital computer systems Anatomy of a digital computer	5	Lecture, GD
II	Computer Architecture , CPU and memory	6	Lecture
	Secondary storage ,Input/output devices	3	Lecture, GD
III	Introduction to computer software, programming language	5	Lecture
	Operating systems, Introduction DBMS	4	Lecture
IV	Computer Network , Internet, WWW	5	Lecture
	E-mail , Introduction to Intranet, Mobile computing and business on the internet	4	Lecture, GD
V	Introduction to computer security, computer viruses, bombs, worms	5	Lecture, GD
	Multimedia Applications, Computer in Educations and Training, Entertainment, Science, Medicine and Engineering.	4	Lecture, Assignment

Name of the Course Designers:
1. Mrs. R.Tamil Selvi
2. Ms. S.Saranya

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core Practical-1	20U1FMP1	C Programming – Lab	2	3	40	60	100

Course Objectives:
1. To acquire knowledge on the basis of C programming and train them to develop user friendly application code using C.
2. To familiarize the concept of Decision making and Looping.
3. To understand and apply the concepts of Array its declaration and uses.
4. Be familiar with programming environment with C programming structure and to implement.
5. To learn the concept of file structure and pointers used in code development.

Unit-I:Overview of C
1. Write a C program to find the Simple Interest,
2. Write a C program to find the Compound Interest.
3. Write a C program to find the sum of N Natural Numbers using formula.

Unit-II: Managing I/O Operations
4. Write a C program to check the given number is odd or even.
5. Write a C program to find the biggest 3 distinct numbers.
6. Write a C program to check the given character is vowel or not.
7. Write a C program to check the given number is Prime or not.
8. Write a C program to find the sum of digits of a given number.

Unit-III: Arrays
9. Write a C program to arrange the given list of numbers.
10. Write a C program to arrange the given list of Strings.
11. Write a C program to check the given string is palindrome or not.
12. Write a C program to perform Matrix Addition.
13. Write a C program to perform Matrix Multiplication.

Unit-IV: User-defined functions and Structures
14. Write a C program to convert Binary to Decimal and vice-versa.
15. Write a C program to find the Factorial value using recursion.
16. Write a C program to find the reverse of a given string using recursion.
17. Write a C program to process the student mark list using structures.

Unit-V: Pointers and Files:
18. Write a C program to process Employee Records using Files.
19. Write a C program for case conversion of file content.
20. Write a C program to perform arithmetic operations using Pointers.

Web Resources
1. https://www.tutorialspoint.com/cprogramming/
2. https://www.programiz.com/c-programming/
3. https://www.geeksforgeeks.org/c-language-set-1-introduction/

Pedagogy

       Projector, Demonstration and Practical Session.

Course Learning Outcomes:

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

CLO No.	Course Learning Outcomes	K - Level
CLO 1	Outline the logic using flowchart for a given problem and develop programs using conditional and looping statements.	Up To K3
CLO 2	Develop programs with implementation of arrays, functions and parameter passing techniques.	Up To K2
CLO 3	Develop programs with string handling functions	Up To K3
CLO 4	Construct programs with Structure and Union features.	Up To K3
CLO 5	Gain skills to write file programs and perform various operations on files.	Up To K3

Mapping of CLOs with POs:

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	3	2	N/A	3
CLO2	3	2	N/A	N/A	2
CLO3	3	2	N/A	N/A	3
CLO4	3	1	N/A	N/A	1
CLO5	3	3	N/A	N/A	3

      3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSOs:

COs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	CO1	3	2	3	2	N/A
CLO2	CO2	3	2	3	1	1
CLO3	CO3	3	1	3	1	N/A
CLO4	CO4	3	2	3	2	N/A
CLO5	CO5	3	3	3	3	N/A

      3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Allied-2	20U2FAC2	Resource Management Techniques	5	6	25	75	100

Course Objectives:

1. To gain the Knowledge of making Linear programming problems from Real time situations.
2. To apply simplex methods and its variants to solve the variety of Complex problems.
3. To acquire the benefits of allocating works using Transportation & Assignment problems.
4. To solve the problems using different strategies using Games.
5. To simplify the development work / project by planning with the help of Networking.

Unit-I: Linear Programming Problem – I

Mathematical Formulation of the problem – Graphical Solution – Introduction- Graphical Solution Method – Some exceptional cases- General L.P.P. – Canonical and Standard forms of L.P.P.

Unit-II: Linear Programming Problem – II

Simplex Method – Introduction – Fundamental Properties of Solutions – The computational procedure – Use of Artificial Variable. Duality in linear programming – Introduction – The general Primal-Dual pair – Formulating a dual problem – Duality and Simplex method.

Unit-III: Transportation and Assignment problem

Transportation Problem – Introduction – General Transportation Problem – The transportation table – Solution of a Transportation problem – Finding an initial basic feasible solution – Test for optimality – Transportation Algorithm (MODI method). Assignment Problem – Introduction – Mathematical formulation of the problem – The assignment method – Special cases in assignment problems – A typical assignment problem – The traveling salesman problem.

Unit-IV: Game Theory

Introduction – Two-person zero-sum games – Some basic terms – The Maxmin-Minimax principle – Games without Saddle points-mixed strategies – Graphic solution of 2 x n and m x 2 games – Dominance property – Arithmetic method for n x n games.

Unit-V: Network Scheduling

Introduction – Network and basic components – Logical sequencing – Rules of network Construction – Critical path analysis – Distinction between PERT and CPM.

Books for Study

1. Kanti Swarup, P.K. Gupta, Man Mohan – "Operations Research" – 18th edition, Sultan Chand & Sons Educational Publishers, New Delhi.
   Chapters:
   Unit – I : 2.1 – 2.3, 3.1 - 3.5
   Unit – II : 4.1 - 4.4, 5.1 – 5.3, 5.7

Unit – III: 10.1, 10.2, 10.5, 10.8 - 10.10, 10.13, 11.1 - 11.5, 11.7.
Unit – IV : 17.1 - 17.8.
Unit – V : 25.1 - 25.4, 25.6, 25.8.

Books for Reference
1. Hamdy A. Taha – "Operations Research an Introduction" – PHI, 8th edition.
2. S.D. Sharma – "Operations Research" – 12th edition, Kedar Nath Ram Nath & Co Publishers, Meerut.

Web Resources
1. https://www.mathcity.org/msc/notes/operation_research
2. http://www.pondiuni.edu.in/storage/dde/downloads/mbaii_qt.pdf

Pedagogy
Chalk and talk , Materials, Assignment , Seminar , Problem solving , Group discussion, and Interaction.

Course Learning Outcomes:
On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K -Level
CLO1	List the rules for formulating LPP. Apply the rules to formulate the mathematical formulation. Find the solution for Graphical method problems. Discuss the Canonical and standard forms.	Up To K3
CLO2	Describe the steps of computing Simplex method. Illustrate the usage of various simplex methods. Outline the duality principles and solve the problems by applying simplex methods.	Up To K3
CLO3	Explain various ways to find Initial BFS for transportation problem. Classify the various problem solving techniques in Assignment methods. Find solution for traveling salesman problem.	Up To K4
CLO4	Outline the strategies used in Games. Solve the games using graphical method and Dominance theory. Describe Arithmetic method.	Up To K3
CLO5	Discuss the network components, Construction rules. Examine the Critical path in network construction. Relate PERT and CPM.	Up To K4

Mapping of CLOs with POs:

CLOs/ POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	3	1	NA	3
CLO2	3	2	NA	NA	1
CLO3	3	3	NA	3	2
CLO4	3	2	1	NA	2
CLO5	3	3	NA	3	3

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSOs:

CLOs/ PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	N/A	N/A	N/A	N/A	N/A
CLO2	3	1	N/A	N/A	N/A	N/A
CLO3	3	3	3	2	3	2
CLO4	3	2	1	N/A	2	3
CLO5	3	3	3	1	3	3

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Resource Management Techniques
Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl.No	CLOs	K - Level	Section A MCQs		Section B Short Answers		Section C (Either/ or Choice)	Section D (Open Choice)
			No. of Questions	K - Level	No. of Questions	K - Level		
1	CLO 1	Up to K 3	2	K1 & K2	1	K1	2(K1 & K1)	1(K3)
2	CLO 2	Up to K 3	2	K1 & K3	1	K3	2(K3 & K3)	1(K2)
3	CLO 3	Up to K 4	2	K1 & K2	1	K1	2(K2 & K2)	1(K4)
4	CLO 4	Up to K 3	2	K1 & K2	1	K2	2(K3 & K3)	1(K1)
5	CLO 5	Up to K 4	2	K1 & K3	1	K3	2(K4 & K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Level	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	10	29	24.17	45%
K2	3	2	10	10	25	20.83	
K3	2	4	20	20	46	38.33	38%
K4	-	-	10	10	20	16.67	17%
Total Marks	10	10	50	50	120	100.00	100%

Lesson Plan:

Units	Topics to be Covered	Hours	Mode
I	Mathematical Formulation of the problem – Graphical Solution – Introduction- Graphical Solution Method.	7	Lecture
	Some exceptional cases- General L.P.P. – Canonical and Standard forms of L.P.P.	7	Lecture
	Various problems discussions	4	Lecture, GD
II	Simplex Method – Introduction – Fundamental Properties of Solutions – The computational procedure	6	Lecture
	Use of Artificial Variable. Duality in linear programming – Introduction	7	Lecture
	The general Primal-Dual pair – Formulating a dual problem – Duality and Simplex method.	5	Lecture, GD
III	Transportation Problem – Introduction – General TP– The transportation table – Solution of a Transportation problem – Finding an initial BFS.	6	Lecture
	Test for optimality – Transportation Algorithm (MODI method). Assignment Problem – Introduction – Mathematical formulation of the problem.	6	Lecture
	The assignment method – Special cases in assignment problems – A typical assignment problem – The traveling salesman problem.	6	Lecture
IV	Introduction – Two-person zero-sum games – Some basic terms – The Maxmin-Minimax principle.	6	Lecture, Power Point
	Games without Saddle points-mixed strategies – Graphic solution of 2 x n and m x 2 games.	7	Lecture & GD
	Dominance property – Arithmetic method for n x n games.	5	Lecture & GD
V	Introduction – Network and basic components – Logical sequencing.	5	Lecture, PPT
	Rules of network Construction – Critical path analysis.	7	Lecture, GD
	Distinction between PERT and CPM and discussing various problems.	6	Lecture, Assignment

Name of the Course Designers:
1. Mrs. S. Rajalakshmi
2. Mrs. R. Tamilselvi

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core – 3	20U2FMC3	Object Oriented Programming with C++	2	3	25	75	100

Course Objective:

1. To introduce the C++ programming and its use in Object oriented environment, learn how to write Inline functions for efficiency & performance.
2. To learn how to implement types of Constructors and class member functions.
3. To demonstrate types of inheritance and applied in various applications.
4. To create & process data in files using file I/O functions.
5. To learn how to design & implement generic classes with C++ templates.

Unit-I: Principles of Object-Oriented Programming

Basic Concepts of Object-Oriented Programming – Benefits of OOP – Structure of a C++ Program – Tokens – Operators in C++ – inline functions – Function overloading –classes and objects: specifying a class – Defining member functions – Making an outside function inline – Friendly functions –Object as function arguments – Returning objects.

Unit-II: Constructor

Constructors – Parameterized constructor – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Destructors. Operator overloading: Defining operator overloading – Overloading unary operators – Overloading binary operators – Overloading binary operators using friend function – Rules for overloading operators

Unit-III: Inheritance

Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance - Virtual base classes – Constructors in derived class – Member classes: Nesting of classes.

Unit-IV: I/O Operations and Files

C++ Stream classes – Unformatted I/O operations – Managing output with manipulators. Classes of file stream operations – Opening and Closing files – Detecting end of file – More about open() function – File modes, File pointers and their manipulation – Sequential input and output operations – Command-line arguments.

Unit-V: Templates and Exception Handling

Class Templates - Class Templates with Multiple Parameters–Function Templates-Basics of Exception Handling– Exception Handling Mechanism.

Books for Study

1. E. Balagurusamy, Object Oriented Programming with C++, Sixth Edition-2013, McGraw Hill Education (India) Private Limited, New Delhi.
   Chapters:
   Unit I – 1.5,1.6,2.6,3.2,3.14,4.6,4.10,5.3,5.4,5.6,5.14-5.16

Unit II   – 6.2 to 6.7, 6.11, 7.2 – 7.5, 7.8
Unit III – 8.2 – 8.9, 8.11-8.12
Unit IV – 10.3, 10.4, 10.6, 11.2-11.7, 11.10
Unit V   – 12.2, 12.3, 12.4, 13.2, 13.3

Books for Reference

1. Herbert Schildt, C++ - The Complete Reference, 1998,TMH
2. Paul Deitel, Harvey Deitel, C++ How to Program, Ninth edition (2014)PHI
3. Ashok N.Kamthane, Object Oriented Prog., with ANSI & Turbo C ++, Pearson Education
4. PoornachandraSarang,Object-Oriented Programming With C++ , 2nd Edition, PHI

Web Resources

1. https://www.learncpp.com/
2. https://hackr.io/tutorials/learn-c-plus-plus
3. https://www.programiz.com/cpp-programming/examples

Pedagogy

Chalk and talk , Materials, PPT, Assignment , Seminar , Problem solving , Group discussion , Interaction, and Demonstration.

Course Learning Outcomes:

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

CLO No.	Course Learning Outcomes	K - Level
CLO1	Explain keywords, tokens, variables constants and datatypes. Apply different types of operators, looping concepts and conditional statements for developing the code. Describe the concepts of oops and its benefits.	Up To K3
CLO2	Develop the constructor and destructor with their types in user defined Functions	Up To K4
CLO3	Illustrate the concepts of inheritance and its types.	Up To K3
CLO4	Discuss various IO Formatting.	Up To K3
CLO5	Utilize Exception for handling Run-Time errors.	Up To K4

Mapping of CLOs with POs:

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	2	N/A	1
CLO2	2	1	N/A	N/A	1
CLO3	2	3	N/A	N/A	2
CLO4	3	3	N/A	N/A	3
CLO5	2	3	N/A	N/A	3

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSOs:

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	N/A	3	N/A	2	2
CLO2	3	3	2	2	1	N/A
CLO3	3	3	2	N/A	3	3
CLO4	3	3	3	N/A	3	3
CLO5	2	2	3	2	3	2

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Object Oriented Programming with C++
Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl.No	CLOs	K – Level	Section A MCQs		Section B Short Answer		Section C (Either / or Choice)	Section D (Open Choice)
			No.of Questions	K - Level	No.of Questions	K - Level		
1	CLO 1	Up to K 2	2	K1 & K1	1	K2	2 (K1 & K1)	1(K2)
2	CLO 2	Up to K 4	2	K2 & K2	1	K2	2 (K4 & K4)	1(K2)
3	CLO 3	Up to K 3	2	K1 & K1	1	K3	2 (K3& K3)	1(K3)
4	CLO 4	Up to K 3	2	K2 & K2	1	K3	2 (K3 & K3)	1(K3)
5	CLO 5	Up to K 4	2	K4 & K4	1	K3	2 (K1 & K1)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining analyzing , presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K - Level	Section A (No Choice)	Section B (No Choice)	Section C (Either / or Choice)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	4	-	20	-	24	20	43 %
K2	4	4	-	20	28	23.3	
K3	-	6	20	20	46	38.3	39%
K4	2	-	10	10	22	18.3	18%
Total Marks	10	10	50	50	120	100.00	100 %

Lesson Plan:

Units	Topics to be covered	Hours	Mode
1	Basic Concepts of OOPs-Benefits of OOPs-Structure of a C++ Program - Tokens – Operators in C++ – inline functions – Function overloading	4	Lecture
	Specifying a Class–Defining member functions–Making an outside function inline–Static data member–Static member function–friendly function–Object as function arguments–Returning Objects	5	Lecture
2	Constructor and destructor-Parameterized Constructor –Multiple constructors in a class–Constructors with default arguments – Dynamic initialization of objects –Copy Constructor–Destructor	4	Lecture
	Defining operator overloading – Overloading unary operators – Overloading binary operators – Overloading binary operators using friend function–Rules for overloading operators.	5	Lecture
3	Defining Derived Class - Single inheritance – Making a private member inheritable – Multilevel inheritance –Multiple inheritance – hierarchical inheritance– hybrid inheritance–virtual base classes – Constructors in derived class– Member classes: Nesting of classes	9	Lecture
4	C++ Streams classes –Unformatted I/O operations – Managing output with manipulators– Classes for file stream operations – Opening and Closing a file– Detecting End -of -file–More about open () file modes	5	Lecture
	File pointers and their Manipulations– Sequential Input and Output Operations– Command line arguments.	4	Lecture
5	Class templates– Class templates with multiple parameters	4	Lecture, GD
	Function templates– Basics of Exception handling– Exception handling mechanism.	5	Lecture, Assignment

Name of the Course Designers:
1. Ms. S. Saranya
2. Mrs. R. Lakshapriya

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core – 4	20U2FMC4	Digital Principles and Applications	2	3	25	75	100

Course Objective:
1. To acquire knowledge on Number systems and Logic gates.
2. To examine the various Logical Expressions.
3. To analyze various Data circuits & Arithmetic operations.
4. To demonstrate the Clocks and Timing Circuits.
5. To characterize various Sequential Circuits.

Unit-I: Number systems and Digital Logic
Binary Number System-Binary to Decimal Conversion-Decimal to Binary conversion -Octal numbers - Hexadecimal numbers -The ASCII code -The Excess-3 code -The Gray Code – transistor inverter. Digital Logic - Basic gates-NOT, OR, AND-Boolean Algebra - Universal logic gates-NOR, NAND.

Unit-II: Combinational logic circuits
Boolean Laws and Theorems -Sum of Products method -Truth table to Karnaugh map -Pairs, Quads, and Octets –Karnaugh simplifications -Don't care condition- Product of sums method -product of sums simplification.

Unit-III: Data Processing circuits
Multiplexers -Demultiplexers -1 of 16 Decoder –BCD to decimal Decoders -Seven segment Decoders. Arithmetic circuits: Binary Addition -Binary Subtraction - 2's & 1's complement Representation -Complement Arithmetic -Arithmetic Building Blocks.

Unit-IV: Flip-Flops and Timers
RS FLIP FLOP- D FLIP- FLOP - JK FLIP-FLOPs – JK MASTER SLAVE FLIP- FLOP. Clocks and Timing circuits: 555 Timer-Astable-555 Timer – Monostable.

Unit-V: Shift Registers and Counters
Types of Registers -Serial-In -Serial-Out-Serial-In -Parallel-Out -Parallel-In-Serial-Out -Parallel-In -Parallel-Out. Counters: Ring Counter – Ripple Counter - Synchronous Counters.

Book for Study
1. Albert Paul Malvino, Donald P.Leach, , Digital Principles and Application, 7thEdn, 2011, McGraw Hill Publication.
   Chapters:
   Unit-I : 1, 4
   Unit-II : 2
   Unit-III : 3.1 to 3.6, 5.1 to 5.7
   Unit-IV : 8.1, 8.3, 8.6, 8.7, 9.3, 9.4
   Unit-V : 10, 11.1, 11.3

Books for Reference
1. Morris Mano, 2005, Digital Logic and computer design, Prentice -Hall of India.
2. RonaldJ.Tocci, 2007, Digital System Principles and Application, Prentice -Hall of India.

Web Resources
1. https://www.tutorialspoint.com/digital_circuits/
2. https://www.electronics-tutorials.ws/sequential/seq_5.html
3. https://soaneemrana.org/onewebmedia/DIGITAL PRINCIPLEs AND Application BY LEACH & MALVINO.pdf

Pedagogy

Chalk and talk , Materials, PPT, Assignment , Seminar , Problem solving , Group discussion , Interaction and Demonstration.

Course Learning Outcomes:
On the successful completion of the course, students will be able to

CLO No.	Course Learning Outcomes	K – Level
CLO1	Illustrate the basic idea about number systems and to learn conversion from one number system to another number system.	Up To K3
CLO2	Examine various logical expressions	Up To K4
CLO3	Analyze various data processing circuits.	Up To K4
CLO4	Explain characteristics of Clocks and Timing Circuits.	Up To K2
CLO5	Compare various sequential circuits.	Up To K2

Mapping of COs with POs:

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	1	2	1	3	1
CLO2	1	1	1	NA	1
CLO3	1	3	2	NA	2
CLO4	1	3	3	NA	3
CLO5	1	1	3	3	2

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLOs with PSOs:

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	3	3	3	3	3
CLO2	3	3	3	3	3	3
CLO3	3	2	3	2	3	2
CLO4	2	2	2	1	2	1
CLO5	2	1	2	1	3	1

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Digital Principles and Applications
Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl.No	CLOs	K - Level	Section A MCQs		Section B Short Answer		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K - Level		
1	CLO 1	Up to K 3	2	K3 & K3	1	K3	2 (K3 & K3)	1(K3)
2	CLO 2	Up to K 4	2	K4 & K4	1	K4	2 (K3 & K3)	1(K4)
3	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K2& K2)	1(K4)
4	CLO 4	Up to K 3	2	K1 & K2	1	K3	2 (K3 & K3)	1(K2)
5	CLO 5	Up to K 2	2	K1 & K2	1	K1	2 (K1 & K1)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each section			10		10		25	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining analyzing , presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K – Level	Section A (No Choice)	Section B (No Choice)	Section C (Either / or Choice)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	3	2	10	-	15	12.5	42%
K2	3	2	10	20	35	29.16	
K3	2	4	30	10	46	38.33	38%
K4	2	2	-	20	24	20	20%
Total Marks	10	10	50	50	120	100.00	100 %

Lesson Plan:

Units	Topic	Hours	Mode
I	Binary Number System-Binary to Decimal conversion-Decimal to Binary conversion -Octal numbers -Hexadecimal numbers -The ASCII code -The Excess-3 code -The Gray Code.	6	Lecture, GD
	Basic gates-NOT, OR, AND-Boolean Algebra - Universal logic gates-NOR, NAND.	3	Lecture
II	Combinational logic circuits Boolean Laws and Theorems -Sum of Products method -Truth table to Karnaughmap -Pairs, Quads, and Octets – Karnaugh simplifications -Don't care condition.	6	Lecture, GD
	Product of sums method -product of sums simplification.	3	Lecture, GD
III	Multiplexers -Demultiplexers -1 of 16 Decoder –BCD to decimal Decoders -Seven Segment Decoders.	6	Lecture
	Binary Addition -Binary Subtraction - 2's & 1's complement Representation -Complement Arithmetic -Arithmetic Building Blocks.	3	Lecture& GD
IV	RS FLIP FLOP- D FLIP- FLOP - JK FLIP-FLOPs – JK MASTER SLAVE FLIP- FLOP.	5	Lecture
	555 Timer-Astable - Monostable.	4	Lecture
V	Types of Registers -Serial-In -Serial-Out-Serial-In -Parallel-Out -Parallel-In-Serial-Out -Parallel-In -Parallel-Out.	5	Lecture, PPT
	Ring Counter – Ripple Counter - Synchronous Counters.	4	Lecture, Assignment

Name of the Course Designers:
1. Mrs. S. Sasikala
2. Mrs. S. Rajalakshmi

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology					
Sem.	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core Practical – 2	20U2FMP2	OOPs with C++ - Lab	3	3	40	60	100

Course Objectives:

1. To introduce the C++ programming and its use in Object oriented Environment, learn how to write Inline functions for efficiency & performance.
2. To learn how to implement types of Constructors and class member functions.
3. To demonstrate types of inheritance and applied in various applications.
4. To create & process data in files using file I/O functions.
5. To learn how to design & implement generic classes with C++ templates.

Unit-I: Principles of Object-Oriented Programming

1. Write a C++ program to find biggest of three distinct integers.
2. Write a C++ program to Compound Interest.
3. Write a C++ program for Sum of N numbers.
4. Write a C++ program for simple Arithmetic Operations using Inline function.
5. Write a C++ program to find the area of geometric shapes using Function Overloading.

Unit-II: Classes and Objects

6. Write a C++ program to create a class for student to get and print details of N students.
7. Write a C++ program to swap private data members of classes named as class_1, class_2 using Friend Function.
8. Write a C++ program to count the created Objects using Static Member Function.
9. Write a C++ program to demonstrate Constructor Overloading.

Unit-III: Operator Overloading and Inheritance

10. Write a C++ program for unary increment and decrement operator overloading.
11. Write a C++ program to add two objects using binary plus operator overloading.
12. Write a C++ program to read and print employee information using Multiple Inheritance.
13. Write a C++ program to demonstrate Multilevel Inheritance.

Unit-IV: I/O Operations and Files

14. Write a C++ program to implement I/O operations on characters.
15. Write a C++ program for file creation and to list the file content.
16. Write a C++ program to perform File Manipulations.
17. Write a C++ program to count words and lines of a text file.

Unit-V: Templates with Exception Handling

18. Write a Template Based C++ Program to sort the given list of elements.
19. Write a C++ program that uses function Templates to find the Largest and Smallest number in a list.
20. Write a C++ program to demonstrate the Catching of All Exceptions.

Web Resources:

1. https://www.learncpp.com/
2. https://hackr.io/tutorials/learn-c-plus-plus
3. https://www.programiz.com/cpp-programming/examples

Pedagogy

Projector, Demonstration and Practical Session.

Course Learning Outcomes:

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

CLO No.	Course Learning Outcomes	K -Level
CLO1	Construct the procedural and object oriented paradigm with concepts of streams, classes, data and objects and familiarize with the language environment.	Up To K2
CLO2	Build programs with various function related concepts.	Up To K3
CLO3	Develop code on operator overloading and constructors.	Up To K3
CLO4	Implement programs on inheritance categories and type conversions and files.	Up To K2
CLO5	Demonstrate the implementation templates and exception handling	Up To K3

Mapping of CLOs with POs:

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	2	N/A	1
CLO2	3	1	N/A	N/A	1
CLO3	3	3	N/A	N/A	2
CLO4	3	3	N/A	N/A	3
CLO5	3	3	N/A	N/A	3

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Mapping of CLO's with PSOs:

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	N/A	3	N/A	2	2
CLO2	2	3	1	2	2	N/A
CLO3	2	3	2	N/A	1	2
CLO4	3	3	3	N/A	3	3
CLO5	2	3	3	2	3	2

3- Advanced Application; 2- Intermediate Level; 1- Basic Level; N/A- Not Applicable

Department of Microbiology

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Academic Year 2020-2021 onwards

The Madura College, Madurai
Department of Microbiology

Vision:

- The Department strives to provide high quality education in the field of Microbiology and Biological sciences to produce world class, highly qualified competent and socially responsible graduates who work together to achieve the goals.

Mission:

- To provide a basic and fundamental knowledge in life sciences that includes the skills in the theory and practicals.
- To promote good quality of education and inspiring training in various disciplines of Microbiology.
- To create a conducive environment for innovation and application in the field of Microbiology.
- To train the students in both practical and theoretical aspects of Microbiology.
- To motivate and guide the students to develop new techniques in Microbiology and to achieve excellence in academic and employment career in the field of biological sciences.

The Graduate Attributes

a. Knowledge in core competency
b. Problem analysis
c. Design and development of solutions for complex problems
d. Conduct investigations of complex problems
e. Modern tool usage
f. Environment and sustainability
g. Ethics
h. Individual and team work
i. Communication
j. Project management and finance
k. Life-long learning

Programme Educational Objectives (PEOs)

The objectives of this programme are:

PEOs	Programme Educational Objectives
PEO-1	To provide graduates with fundamental knowledge about life science especially microbiology with a view to impart in them high quality scientific skills like analyzing, designing and implementing techniques.
PEO-2	To prepare graduates with recent scientific developments in the field of life Science and help them for life learning.
PEO-3	To train graduates to choose a suitable career option or higher studies and excel in competitive examination.
PEO-4	To make graduates with interpersonal skills and social responsibility in order to become good team members and leaders.
PEO-5	To accomplish ability to communicate effectively and able to understand ethical responsibility.
PEO-6	To get adequate knowledge to use information and communication technology.
PEO-7	To carry on to learn and to adapt in a world of constantly evolving technology.

Programme Specific Outcomes (PSOs)

On the successful completion of B.Sc., Microbiology, the students will be able to

PSOs	Programme Specific Outcomes	Graduate Attributes
PSO-1	Understand, analyze and apply microbiological techniques in the areas related to medical, food, agricultural, environmental, industrial and pharmaceutical microbiology field.	a. Knowledge in core competency b. Problem analysis c. Design and development of solutions for complex problems
PSO-2	Apply recent microbiological techniques in creating career paths to become an entrepreneur or getting higher studies/employability in the field of microbiology.	c. Design and development of solutions for complex problems k. Life-long learning
PSO-3	Design scientific methodology, hypothesis generation and testing, design and execution of experiments.	c. Design and development of solutions for complex problems d. Conduct investigations of complex problems h. Individual and team work
PSO-4	Recognize the application oriented aspects of Microbiology.	e. Modern tool usage
PSO-5	Acquire and demonstrate proficiency in good laboratory practices in a microbiological laboratory.	g. Ethics j. Project management and finance
PSO-6	Build proficiency in the quantitative skills necessary to analyze biological problems.	b. Problem analysis c. Design and development of solutions for complex problems d. Conduct investigations of complex problems
PSO-7	Develop strong oral and written communication skills through the effective presentation of experimental results as well as through seminars.	e. Modern tool usage i. Communication j. Project management and finance

Semester	Subject Code	Paper	Title of the paper	Hours/week	Credits
I		Language-I		6	3
		English-I		6	3
		VE & PE	Value Education and Professional Ethics	3	3
		Ancillary-I Theory 1/1		4	4
		Ancillary-I Practicals		2	--
	20U1RMC1	Major Core-1	General Microbiology	3	3
	20U1RMC2	Major Core-2	Basic Techniques in Microbiology	3	3
		Major Practicals-1*	Lab in General Microbiology and Basic Techniques in Microbiology	3	--
				30	**19**
II		Language-II		6	3
		English-II		6	3
		E & GS	Environmental and Gender Studies	3	3
		Ancillary-I Theory 1/2		4	4
		Ancillary-I Practicals		2	2
	20U2RMC3	Major Core-3	Microbial Taxonomy	3	3
	20U2RMC4	Major Core-4	Cell and Molecular Biology	3	3
	20U2RMP1	Major Practicals-1	Lab in General Microbiology, Basic Techniques in Microbiology , Microbial Taxonomy and Cell and Molecular Biology	3	3
		Extension		--	1
				30	**25**
III		Language-III		6	3
		English-III		6	3
	20U3RNM1	NME-I	Nutrition and Health	2	2
	20U3RSM1	SBE-I	Cosmetic Microbiology	2	2
		Ancillary-II Theory 2/3		4	4
		Ancillary-II Practicals		2	--
	20U3RMC5	Major Core-5	Biochemistry	5	5
		Major Practicals-2*	Lab in Biochemistry and Cosmetic Microbiology	3	--
				30	**19**

IV		Language-IV		6	3
		English-IV SS		6	3
	20U4RNM2	NME-II	Microbes in Human Welfare	2	2
	20U4RSM2	SBE-II	Immunology and Immunotechnology	2	2
		Ancillary-II Theory 2		4	4
		Ancillary-II Practicals		2	2
	20U4RMC6	Major Core-6	Microbial Physiology	5	5
	20U4RMP2	Major Practicals-2	Lab in Biochemistry, Cosmetic Microbiology, Immunology and Immunotechnology, Microbial Physiology	3	3
				30	**24**
V	20U5RSM3	SBE-III	Diagnostic Microbiology and Haematology	2	2
	20U5RMC7	Major Core-7	Environmental Microbiology	5	5
	20U5RMC8	Major Core-8	Medical Microbiology	5	5
	20U5RMC9	Major Core-9	Microbial Genetics	5	5
	20U5RME1	Major Elective-I		4	4
	20U5RME2	Major Elective-II		3	3
		Major Practicals-3*	Lab in Diagnostic Microbiology and Haematology, Medical Microbiology, Parasitology and Entomology	3	--
		Major Practicals-4*	Lab in Environmental Microbiology, Microbial Genetics, Biostatistics and Bioinformatics	3	--
				30	**24**
VI	20U6RSM4	SBE-IV	Entrepreneurship in Microbiology	2	2
	20U6RMC10	Major Core-10	Food Microbiology	5	5
	20U6RMC11	Major Core-11	Biotechnology	5	5
	20U6RMC12	Major Core-12	Pharmaceutical and Forensic Microbiology	5	5
	20U6RME3	Major Elective-III		4	3
	20U6RME4	Major Elective-IV		3	3
	20U6RMP3	Major Practicals-3	Lab in Food Microbiology, Biotechnology and Fermentation Technology	3	3
	20U6RMP4	Major Practicals-4	Lab in Pharmaceutical and Forensic Microbiology, Microbial Nanotechnology and Entrepreneurship in Microbiology	3	3
				30	**29**

Exam will be conducted at the even semester

Elective Papers* for B.Sc., Microbiology

Semester	Paper	Title of the paper
V	Major Electives I and II	1. Biostatistics and Bioinformatics
		2. Parasitology and Entomology
		3. Biosafety and Bioethics
		4. Introduction to Genomics
VI	Major Electives III and IV	1. Fermentation Technology
		2. Microbial Nanotechnology
		3. Agricultural Microbiology
		4. Veterinary Microbiology

***Students can choose any 2 papers each in V and VI Semesters as electives**

Ancillary Microbiology Papers for B.Sc., Biotechnology

Semester	Subject Code	Paper	Title of the paper	Hours	Credits
III	20U3RAC1	Ancillary-I Theory	Basic Microbiology	4	4
		Ancillary-I Practicals*	Lab in Basic Microbiology	2	-
IV	20U4RAC2	Ancillary-II Theory	Applied Microbiology	4	4
	20U4RAP1	Ancillary-II Practicals	Lab in Basic Microbiology and Applied Microbiology	2	2

Exam will be conducted at the even semester

Certificate Course for B.Sc., Microbiology

Semester	Course code	Paper	Title of the paper	Hours	Credits
I	CRC01	Certificate course	Mushroom Technology	2	2

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core	20U1RMC1	General Microbiology	3	3	25	75	100

Course Objectives:

1. To understand history of microbiology towards modern microbiology
2. To understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes
3. To know the pathogenesis and treatment for different microbial diseases
4. To gain knowledge about the structure of bacteria, fungi, algae, protozoa and viruses
5. To know about different classes of antibiotics and their mode of actions, treatment strategies and detection of resistant forms of bacteria from clinical settings.

Unit-I: History and Scope of Microbiology

Biogenesis and Abiogenesis, Spontaneous generation, Germ theory of diseases, Contribution of Redi, Spallanzani, Needham, Louis Pasteur, Tyndal, Leewenhoek, Joseph Lister, Robert Koch, Edward Jenner, Winogradsky, Flemming, William Beijernick, Emil Christian Hansen, Elie Metchinikoff and Kary Mullis. Scope and applications of Microbiology.

Unit-II: Microbial Diversity and Extremophiles

Prokaryotes, Eukaryotes and their differences. Archaebacteria and Eubacteria, Mycoplasma with examples. Acidophiles, AlkalophilesNeutrophiles, Psychrophiles, Mesophiles, Thermophiles, Aerobes and Anaerobes, Halophiles, Osmophiles, Barophiles with examples and their adaptations.

Unit-III: Morphology and fine Structure of Bacteria

Bacterial cell size, shape, arrangement – gram positive , negative cell wall , glycocalyx, capsule, flagella, fimbriae, pili, cell membrane, cytoplasm, growth curve. Endospore: structure, formation, stages of sporulation. Ultra structure and significance of *Pseudomonas putida,* and *Bacillus subtilis.*

Unit-IV: Ultra Structure and Significance of different Microbes

General characteristics of Fungi, Algae, Protozoa and Viruses. Ultra structure and significance of *Saccharomyces* sp. And *Penicillium* sp., *Spirulina*, *Chlamydomonas*, *Amoeba*, *Plasmodium*, HIV and T4 bacteriophage and λ (Lambda) phage.

Unit-V:Antimicrobial Agents

General characteristics of antimicrobial agents-antiseptics, disinfectants. Antibiotics- mechanism of action of beta lactum and aminoglycosides-. Antiviral, antiparasitic, antifungal agents with examples. Antibiotic sensitivity test-Kirby Bauer test and Minimum Inhibitory Concentration test.

Books for Study

1. Michael J Pelczar, JR. E.C.S Chan, Noel R. Krieg;(1998). Microbiology, Tata McGraw-Hill publication, New Delhi.
2. Dubey, R.C& Maheshwari, D.K, (1999). A Text book of Microbiology, S. Chand & Company, New Delhi.

Books for Reference

1. Prescott, Harley and Klein's Microbiology (2008), Mac Graw Hill Higher Education, New York.
2. Jacquelyn G.Black, (2008), Microbiology Principles and Explorations, JohnWiley& Sons Ltd, New York.
3. Rajeshwar Reddy, K. (2009). General Microbiology, New Age Publishers, New York.
4. Sharma   P, (1986). Algae – Series on diversity of Microbes, Tata McGraw Hill Education Private Limited, New Delhi.
5. Madigan, Martinko, Dunlap, (2010). Brock Biology of Microorganisms; Pearson Publication, New York.

Web Resources

1. https://www.periobasics.com/basic-microbiology.
2. https://www.microbiologynutsandbolts.co.basic-concepts.
3. https://www.microbiologyinfo.com/category/basic-microbiology
4. https://www.microbiology -overview-youtube.com
5. https://www.introduction to microbiology. youtube.com

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO):

On the completion of the course the student will be able to

	Course Learning Outcome	**Knowledge Level**
CLO1	Outline the contribution of different scientists in the development of microbiology.	Up to K3
CLO2	Define the basic concept in the field of microbiology	Up to K3
CLO3	Predict the different physiological adaptations during sporulation	Up to K3
CLO4	Interpret the structure & reproduction of bacteria , fungi, algae, protozoa	Up to K2
CLO5	Specify general characters and determine mode of action of various antimicrobial agents	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CLO1	2	1	2	1	3	1	2
CLO2	1	1	1	2	2	1	1
CLO3	1	2	1	1	3	1	1
CLO4	2	2	1	1	2	3	1
CLO5	1	1	2	3	2	1	2

Advance application–3; Intermediate level –2; Basic level –1

Mapping of Course Outcome with Programme Outcome:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CLO1	1	1	1	1	1
CLO2	2	1	1	1	1
CLO3	2	2	1	1	1
CLO4	2	2	1	2	2
CLO5	3	2	2	2	2

Advance application–3; Intermediate level –2; Basic level –1

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**58%**
K2	5	6	20	20	**51**	42.5	
K3	-	-	10	20	**30**	25	**25%**
K4	-	-	10	10	**20**	16.67	**17%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

LESSON PLAN

Units		Description	Staff	Hours	Mode
I **History and Scope of Microbiology**	a)	Biogenesis and Abiogenesis, Spontaneous generation		1	Chalk and Talk
	b)	Germ theory of diseases, Contribution of Redi, Spallanzani, Needham		2	
	c)	Louis Pasteur, Tyndal, Leewenhoek, Joseph Lister		2	
	d)	Robert Koch, Edward Jenner, Winogradsky, Flemming		2	
	e)	William Beijernick, Emil Christian Hansen, Elie Metchinikoff and Kary Mullis. Scope and application of Microbiology.		2	
II **Microbial Diversity and Extremophiles**	a)	Prokaryotes, Eukaryotes and their differences		2	Chalk and Talk
	b)	Archaebacteria and Eubacteria, Mycoplasma with examples		2	
	c)	Acidophiles, AlkalophilesNeutrophiles, Psychrophiles, Mesophiles, Thermophiles		2	
	d)	Aerobes and Anaerobes		1	
	e)	Halophiles, Osmophiles, Barophiles with examples and their adaptations		2	
III Morphology and fine Structure of Bacteria	a)	Bacterial cell size, shape, arrangement		2	Chalk and Talk & PPT
	b)	Gram positive , negative cell wall , glycocalyx, capsule		2	
	c)	Flagella, fimbriae, pili, cell membrane, cytoplasm.		2	
	d)	Growth curve, Endospore: structure, formation, stages of sporulation		2	
	e)	Ultra structure and significance of *Pseudomonas putida,* and *Bacillus subtilis.*		1	
IV **Ultra Structure and Significance of different Microbes**	a)	General characteristics of Fungi, Algae, Protozoa and Viruses		2	PPT & Chalk and Talk
	b)	Ultra structure and significance of *Saccharomyces* sp. and *Penicillium*sp		2	
	c)	*Spirulina*, *Chlamydomonas*, *Amoeba*		3	
	d)	*Plasmodium*, HIV, T4 bacteriophage, and λ		2	
V Antimicrobial Agents	a)	General characteristics of antimicrobial agents- antiseptics, disinfectants.		2	PPT
	b)	Antibiotics- mechanism of action of beta lactum and aminoglycosides		3	
	c)	Antiviral, antiparasitic, antifungal agents with examples		3	
	d)	Antibiotic sensitivity test-Kirby Bauer test and Minimum Inhibitory Concentration test.		1	
Total				**45 Hours**	

Course designers

1. **Mrs. K. Rajeswari**

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core	20U1RMC2	Basic Techniques In Microbiology	3	3	25	75	100

Course Objectives:

1. To learn the basic principles and techniques involved in microbiology and related disciplines
2. To demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures
3. To know various Culture media and their applications and also understand various physical and chemical means of sterilization and cultivation of microbes
4. To know microbial culture media and pure culture techniques for aerobic and anaerobic cultivation methods for bacteria
5. To gain knowledge on principle and working of various laboratory equipments and can able to use them with theoretical knowledge

Unit-I: Bacteriological Techniques

Microscopy-working mechanism and applications of Light microscope, Bright field, Dark field, Phase Contrast, Fluorescent, Electron microscope (TEM and SEM). Confocal microscope. Staining techniques - Smear preparation, Simple staining, Gram's staining, Acid fast staining, Spore staining, Capsule staining and Metachromatic granule staining.

Unit-II: Sterilization and Disinfection

Sepsis, asepsis and contamination. Sterilization - principle and methods – moist heat, dry heat, filtration, radiation, pasteurization, tyndallization, ultrasonication and disinfection. Phenol co-efficient test.

Unit-III: Microbial Culture Media and Cultivation of Microbes

Culture media definition and types - basal, complex, enriched, enrichment, selective, indicator, differential, sugar and transport media. Pure culture techniques- Streak plate, Pour plate, Spread plate. Colony morphology of bacteria and fungi. Cultivation of bacteria, fungi algae and viruses.

Unit-IV: Microbial Growth

Methods of culturing anaerobes – Prereduced media and anaerobic jar. Measurement of microbial growth - cell number and cell mass. Batch culture, continuous culture, diauxic growth and synchronous culture. Factors affecting growth of microorganisms.

Unit-V: Instrumentation

Principle, working mechanism and applications of pH meter, Colorimeter, Ultra centrifuge- Chromatographic techniques – Paper, TLC and Column chromatography, Agarose gel Electrophoresis, UV Spectroscopy, Blotting techniques– Southern blotting, PCR.

Books for Study

1. Pelczar Jr. M.J. Chan. E.C.S and Kreig. N.R (2006). Microbiology- 5th Edition, Mc Graw Hill Inc. New York.
2. Dubey, R.C. and Maheswari, D.K. (2010). A Text Book of Microbiology. 3rd edition, S. Chand, New Delhi.
3. Veerakumari, L. (2009). Bioinstrumentation. MJP Publishers, Chennai.
4. Palanivel, P. (2000). Laboratory manual for analytical biochemistry and separation techniques, Twenty first Century Publications, Chennai.

Books for Reference

1. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/Benjamin Cummings, New York.
2. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education limited, New York.
3. Desai, JD. and Desai, AJ. (1995). Methods in Microbiology Microscopy and Staining, Emkay Publications, New Delhi.
4. Bensen, JR.(1996). Microbiological Applications: A Lab Manual in General Microbiology, Sixth Edition, WMC Brown Publication, U.S.A.
5. Gunasekaran, P. (2008). Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi.
6. Jeyaraman, J. (1985) Lab. Manual in Biochemistry, Wiley Eastern Ltd, New Delhi.

Web Resources

1. https://www.periobasics.com/basic-microbiology.
2. https://www.microbiologynutsandbolts.co.basic-concepts.
3. https://www.microbiologyinfo.com/category/basic-microbiology
4. https://www. Microbiology - Overview -youtube.com
5. https://www. Introduction to microbiology. youtube.com

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO):

On the completion of the course the student will be able to

	Course Learning Outcome	Knowledge Level
CLO1	Explain the principles and types of microscopes and staining techniques	Up to K2
CLO2	Elaborate various physical and chemical means of sterilization	Up to K2
CLO3	Prepare various culture media and microbial techniques for isolation of pure cultures of microorganisms	K1, K3
CLO4	Determine the different growth phases, growth kinetics and physiological adaptations of bacteria	Up to K3
CLO5	Categorize the principles and applications of the various instruments used in biology	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course LearningOutcome with Programme Specific Outcome:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	1	2	2	1	3	1	2
CLO2	1	1	1	2	2	1	1
CLO3	2	1	1	1	3	1	1
CLO4	2	2	1	1	2	3	1
CLO5	1	1	2	3	2	1	2

Advance application–3; Intermediate level –2; Basic level –1

Mapping of Course Outcome with Programme Outcome:

	PO1	PO2	PO3	PO4	PO5
CLO1	2	1	1	2	1
CLO2	1	2	1	1	2
CLO3	2	2	1	1	1
CLO4	3	2	2	1	1
CLO5	3	2	2	2	1

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Units	Description	Staff	Hours	Mode
I **Bacteriological Techniques**	a) Microscopy-working mechanism and applications of Light microscope		1	Chalk and Talk
	b) Bright field, Dark field, Phase Contrast, Fluorescent		2	PPT
	c) Electron microscope (TEM & SEM).		2	Lecture
	d) Staining techniques - Smear preparation, Simple staining, Gram's staining		2	Demonstration
	e) Acid fast staining, Spore staining, Capsule staining and Metachromatic granule staining.		2	Demonstration
II **Sterilization and Disinfection**	a) Sepsis, asepsis and contamination. Sterilization - principle and methods		2	Chalk and talk
	b) Moist heat, dry heat, filtration, radiation		3	PPT
	c) Pasteurization, tyndallization, ultrasonication		2	Discussion
	d) Disinfection. Phenol co-efficient test.		2	Demonstration
III **Microbial Culture Media and Cultivation of Microbes**	a) Culture media definition and types		2	Chalk and talk
	b) basal, complex, enriched, enrichment, selective, indicator		3	Discussion
	c) differential, sugar and transport media. Pure culture techniques		2	Discussion
	d) Streak plate, Pour plate, Spread plate. Colony morphology of bacteria and fungi. Cultivation of bacteria, fungi algae and viruses.		2	Demonstration
IV **Microbial Growth**	a) Methods of culturing anaerobes. Prereduced media and anaerobic jar.		3	Chalk and talk
	b) Measurement of microbial growth - cell number and cell mass.		2	Demonstration
	c) Batch culture, continuous culture, diauxic growth and synchronous culture.		3	Discussion
	d) Factors affecting growth of microorganisms.		1	Discussion
V **Instrumentation**	a) Principle, working mechanism and applications of pH meter		3	PPT
	b) Colorimeter, Ultra centrifuge-Chromatographic techniques Paper, TLC and Column chromatography		3	Demonstration
	c) Agarose gel Electrophoresis, UV Spectroscopy. Blotting techniques– Southern blotting. PCR		3	Demonstration
		Total	**45 Hours**	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**50%**
K2	5	6	10	20	**41**	34.16	
K3	-	-	20	20	**40**	33.33	**34%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Course designers:

    1. **Dr. P.N. Rajarajan**

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core	20U2RMC3	Microbial Taxonomy	3	3	25	75	100

Course Objectives:
1. To impart basic knowledge on microbial diversity and classification.
2. To enable the students to explore the structural variation among the microbes.
3. To relate the structure of a microbe to its uses
4. To classify microbes based on its characteristic features
5. To emphasize the significance of these microbes in day to-day life.

Unit-I: History and Criteria of Classification
Position of microorganisms in living world, Principles of binomial nomenclature. Woese's three kingdom classification, Whittaker's five kingdom concept. Criteria used for classification, taxonomic groups, species concept. Criteria used for classification of bacteria, fungi ,algae and viruses.

Unit-II: Taxonomy of Bacteria
Bacterial nomenclature and taxonomy- Methods of Classification: intuitive methods, numerical taxonomy, genetic approach. Introduction to Bergey's system of classification. Economic importance of bacteria. General characteristics, morphology, ultra structure and reproduction of *Staphylococcus aureus* and *Escherchia coli*.

Unit-III: Taxonomy of Fungi
General criteria for classification of fungi by Alexopoulos and Mims. General characteristics, morphology, ultra structure and reproduction of *Aspergillus niger*and *Candida.* Economic importance of fungi.

Unit-IV: Taxonomy of Algae
Classification of Algae by Bloom, Fritsch. General characteristics, morphology, ultra structure and reproduction of algae – *Spirogyra* and *Anabaena.* Economic importance of algae.

Unit-V: Taxonomy of Viruses
Principles of Virus taxonomy, characteristics used in nomenclature & classification of animal, plant viruses and bacteriophage – Influenza, TMV and M13 viruses. Virions and Prions.

Books for Study
1. Prescott M. (2005). Microbiology. 6th Edition, Tata McGraw – Hill, New Delhi.
2. Dubey RC and Maheswari DK (2005). A text book of Microbiology, Revised Multicolour Edition, Published by S. Chand & Company Limited, New Delhi.
3. Dube, H.C. (2007). A textbook of fungi, bacteria and viruses. Agrobios India.
4. Atlas and Bartha (1997). Microbial ecology. 4th edition. Pearson education, New York.
5. Saravanan. P. (2017). Virology. MJP Publishers, Chennai.

Books for Reference

1. Albert G Moat and John W Foster (2004). Microbial Physiology. 4th Edition, John Wiley & Sons, New York.
2. Robert F Boyd (1984). General Microbiology. Times Mirror / Mosby College Publishers, St. Louis.
3. Garrity, G.M., Boone, D.R. and Castenholz, R.W. (2001). Bergey's Manual of Systematic Bacteriology, 2nd ed., vol. 1, Springer-Verlag, New York.
4. Alexopoulos, C.J. Charles W. Mims, Introductory Mycology, 3rd Edition, John Wiley & Sons, US.
5. Purohit SS (2005). Microbiology – Fundamentals and Applications. Reprinted & Published by Student Edition, Behind Nasrani Cinema, Chopasani Road, Jodhpur.
6. Pelczar TR, Chan ECS &Kreig NR (2006) Microbiology. 5th Edition, Tata McGraw – Hill, New Delhi.
7. Schlegel, H.G., (1993).General Microbiology, Seventh edition, Cambridge University Press, UK.

Web Resources

1. https://www.periobasics.com/basic-microbiology.
2. https://www.microbiologynutsandbolts.co.basic-concepts.
3. https://www.microbiologyinfo.com/category/basic-microbiology
4. https://www. Microbiology - Overview -youtube.com
5. https://www. Introduction to microbiology. youtube.com

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO):

On completion of this course the students will be able to

	Course Learning Outcome	**Knowledge Level**
CLO-1	Define the criteria used for classification of bacteria, fungi, algae and viruses.	Up to K2
CLO-2	Discuss the pros and cons of various classification methods and Classify bacteria	Up to K3
CLO-3	Discuss the characteristics used in nomenclature and classification of fungi with suitable examples.	Up to K2
CLO-4	Compare and contrast the methods of classification of algae, structural organization and economic importance of algae.	Up to K3
CLO-5	Analyse the various characteristics used in nomenclature and classification of animal, plant viruses and bacteriophage.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CLO1	1	2	2	1	3	1	2
CLO2	1	1	1	2	2	1	1
CLO3	2	1	1	1	3	1	1
CLO4	2	2	1	1	2	3	1
CLO5	1	1	2	3	2	1	2

Advance application–3; Intermediate level –2; Basic level –1

Mapping of Course Outcome with Programme Outcome:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CLO1	1	2	2	1	3
CLO2	1	2	1	2	2
CLO3	2	1	3	1	3
CLO4	2	1	3	1	3
CLO5	1	1	3	3	3

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Units	Description	Staff	Hours	Mode
I **History and Criteria of Classification**	a) Position of microorganisms in living world		1	Chalk and Talk
	b) Principles of binomial nomenclature. Woese's three kingdom classification		2	PPT
	c) Whittaker's five kingdom concept		2	Lecture
	d) Criteria used for classification, taxonomic groups, species concept.		2	Chalk and Talk
	e) Criteria used for classification of bacteria, fungi, algae and viruses.		2	Chalk and Talk
II **Taxonomy of Bacteria**	a) Bacterial nomenclature and taxonomy- Methods of Classification: intuitive methods, numerical taxonomy, genetic approach.		2	Chalk and Talk
	b) Introduction to Bergey's system of classification. Economic importance of bacteria.		3	PPT
	c) General characteristics, morphology, ultra structure and reproduction of *Staphylococcus aureus*		2	Demonstration
	d) General characteristics, morphology, ultra structure and reproduction of *Escherchia coli*.		2	Discussion
III **Taxonomy of Fungi**	a) General criteria for classification of fungi by Alexopoulos and Mims and their economic importance.		3	Chalk and Talk
	b) General characteristics, morphology, ultra structure and reproduction of *Aspergillus niger*		3	Chalk and talk, Discussion
	c) General characteristics, morphology, ultra structure and reproduction of *Candida*.		3	PPT
IV **Taxonomy of Algae**	a) Classification of algae by Bloom and their economic importance		2	PPT
	b) Classification of algae by Fritsch and their economic importance		2	Chalk and Talk
	c) General characteristics, morphology, ultra structure and reproduction of algae – *Spirogyra*		2	PPT
	d) General characteristics, morphology, ultra structure and reproduction of algae –*Anabaena*		3	PPT
V **Taxonomy of Viruses**	a) Principles of Virus taxonomy, characteristics used in nomenclature & classification of animal, plant viruses and bacteriophage		3	PPT
	b) Influenza virus		3	PPT Discussion
	c) TMV and M13 viruses.		2	PPT Discussion
	d) Virions and Prions		1	PPT Discussion
Total			**45 Hours**	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**58%**
K2	5	6	20	20	**51**	42.5	
K3	-	-	10	20	**30**	25	**25%**
K4	-	-	10	10	**20**	16.67	**17%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Course designers:

  1. **Dr. A.P. Asha Kannan**

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core	20U2RMC4	Cell And Molecular Biology	3	3	25	75	100

Course Objectives:
1. To understand the basic structure and functions of various cell organelles
2. To comprehend the central dogma of life
3. Appreciate the various cellular mechanisms involved in the control of transcription
4. Gain insights into the various processes involved in the replication of DNA.
5. To explore mechanism of translation.

Unit-I: Cell and Cell Organelles
Overview of prokaryotic and eukaryotic cell. Structure and Functions- Nucleoid, Nucleus, Endoplasmic Reticulum, Golgi apparatus, Lysosomes, Ribosomes, Peroxisome, Mitochondria and Chloroplast. Structure and forms of DNA, Types of RNA.

Unit-II: Cell cycle and Cell division
Cell cycle - cell division types-mitosis and meiosis and their significance. Molecular and biochemical characteristics of cancer cells. Cell ageing, Cell death and its regulation   Apoptosis and Necrosis.

Unit-III: DNA Replication
Types of DNA replication – conservative, dispersive, semi conservative mode, Messelson - Stahl experiment. Mechanism of replication- rolling circle and theta mode. Enzymes involved in DNA replication-DNA polymerase, topoisomerase, helicase, primase and gyrase.

Unit-IV: Transcription
Transcription in Prokaryotes and eukaryotes- Initiation - promoters, sigma and transcription factors. Elongation - RNA polymerase, sub units. Termination - Rho dependent and Rho independent.
Post-transcriptional modifications in eukaryotes.

Unit-V: Translation
Genetic code: Deciphering genetic code, Characteristics of genetic code. Translation in prokaryotes – Initiation, Elongation and Termination. Translation in eukaryotes. Post-translational modifications.

Books for Study
1. Powar, C.B. (2009). Cell Biology. Himalayan Publishing House, New Delhi.
2. Paul, A. (2009). Cell and Molecular Biology. Books and Allied (P) ltd, India.
3. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. (2008). Molecular Cell Biology. 6th Ed., W.H. Freeman & Co., New York.

Books for Reference

1. Alberts, B. Bray, D, Lewis, J, Raff, M, Roberts, K and Watson JD. (1994). Molecular Biology of the Cell (3rd edition). Garland Publishing, Inc., New York
2. Cooper, GM and Hawman RE. (2013). Cell - A Molecular Approach (6th Edition). Sinauer Associates Inc. US.
3. De Roberties E.D.P and E.M.F.DeRoberties. (2011). Cell and Molecular Biology. 8th edition. B.I. PublicatonsPvt. Ltd., India
4. Karp G. (2013). Cell and Molecular Biology - Concepts and Experiments. John Wiley & Sons Inc. New Jersey.
5. Stephen R. B, Jeremy S. H, *et.al*., Cell Biology - A short course, 2nd Edition, John wiley& Sons Inc. New Jersey.

Web Resources

1. https://www.omicsonline.org/scholarly/microbial-genetics.
2. https://www.lamission.edu/lifesciences/Steven/Micro20
3. https://www.indiabix.com Microbiology
4. https://www Microbial Genetics youtube.com

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO):

On the completion of the course the student will be able to

	Course Learning Outcome	Knowledge Level
CLO1	Explain the structure and functions of cell, cell organelles, biological membranes and intercellular communication	Up to K3
CLO2	Appraise the concepts of cells in terms of growth, division and gather an extempore knowledge on different phases of cell cycle	Up to K3
CLO3	Analyse the molecular basis of DNA replication and modes	Up to K4
CLO4	Interpret the transcription process of prokaryotic genomes	Up to K2
CLO5	Elaborate the process of translation in prokaryotes and eukaryotes.	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	1	2	2	1	3	1	2
CLO2	1	1	1	2	2	1	1
CLO3	2	1	1	3	1	1	1
CLO4	2	2	1	1	2	3	1
CLO5	1	1	2	3	2	2	1

Advance application–3; Intermediate level –2; Basic level –1

Mapping of course outcome with Programme outcome:

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	1	2
CLO2	1	3	1	1	2
CLO3	1	2	3	2	2
CLO4	2	3	1	1	2
CLO5	1	2	3	3	2

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Units		Topics	Staff	Hours	Mode
I **Cell and Cell organelles**	a)	Overview of Prokaryotic and Eukaryotic Cell.		1	Chalk & Talk
	b)	Structure and Functions –Nucleoid, Nucleus, Endoplasmic Reticulum.		3	PPT
	c)	Golgiappartus, lysosomes, Ribosome, Peroxisome		2	PPT
	d)	Mitochondria, and Chloroplast. Structure and forms of DNA and types of RNA.		3	PPT
II **Cell and Cell division**	a)	Cell Cycle – Introduction		1	Chalk & Talk
	b)	Cell division types-mitosis and meiosis and their significance.		2	Chalk & Talk
	c)	Molecular and biochemical characteristics of cancer cells.		3	Chalk & Talk
	d)	Cell ageing,cell death and its regulations.		2	PPT
	e)	Apoptosis and Necrosis.		1	PPT
III **DNA Replication**	a)	Types of DNA Replication.		1	OHP
	b)	DNA Replication- Semi conservative mode, Messelson – Stahl Experiment.		2	OHP
	c)	Mechanism of replication.		1	PPT
	d)	Modes of replication-rolling circle and theta mode.		2	PPT
	e)	Enzymes involved in DNA replication-DNA Polymerase, topoisomerase, helicase, primase, and gyrase.		3	Chalk & Talk
IV **Transcription**	a)	Transcription in Prokaryotes and eukaryotes-Initiation - promoters		2	Chalk & Talk
	b)	Sigma and Transcription factors.		3	PPT
	c)	Elongation-RNA Polymerase, Subunits		2	OHP
	d)	Termination-Rho dependent and Rho independent.		1	PPT
	e)	Post-transcriptional modifications in eukaryotes		1	PPT
V **Translation**	a)	Genetic code: Deciphering genetic code.		2	Chalk & Talk
	b)	Characteristics of genetic code		2	Chalk & Talk
	c)	Translation in prokaryotes – Initiation, Elongation and Termination		3	PPT
	d)	Post-translational modifications		2	Chalk & Talk, OHP
Total				**45 Hours**	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
5.	CLO 5	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**75%**
K2	5	6	30	30	**71**	59.16	
K3	-	-	-	10	**10**	8.33	**8%**
K4	-	-	10	10	**20**	16.67	**17%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Course designers:

1. **Mrs. N. Sumathy**

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Semester	Course Type	Course Code	Course Title*	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Practicals	20U2RMCP1	Practical-1	3	3	40	60	100

*Practical-1 Lab in General Microbiology, Basic Techniques in Microbiology, Microbial Taxonomy & Cell And Molecular Biology

Course Objectives:
1. To familiarize in general microbiology techniques.
2. To develop a sufficient background to students about the growth of microbes.
3. To explain the ubiquitous nature and characteristics of microbes.
4. To identify the basic microbial metabolism.
5. To explore different stages of mitosis, meiosis and to isolate genomic DNA.

S.No	Experiments
1.	Principle, methods of sterilization and safety measures.
2.	Preparation of media (simple and selective media).
3.	Pure culture techniques: streak plate, spread plate and pour plate.
4.	Motility determination-Hanging drop method.
5.	Isolation and identification of bacteria and fungi from different environmental samples.
6.	Enumeration of bacteria-viable count (plate count) and total count (Haemocytometer count-yeast cells).
7.	Fungal staining-Lactophenol cotton blue.
8.	Staining methods: simple, negative and capsule
9.	Gram's staining and endospore staining
10.	Measurement of growth rate and generation time by turbidometry method.
11.	Description of compound microscope and its parts.
12.	Mitosis in onion root meristem.
13.	Chromosomal behaviour and Meiosis in flower bud-*Rhoeo.sp*.
14.	Isolation of chloroplast from spinach leaves.
15.	Isolation of genomic DNA from bacterial cells and separation of isolated genomic DNA by agarose gel electrophoresis.

Books for Reference
1. Aneja K.R. (2003). Experiments in Microbiology: Plant Pathology and Tissue Culture. WishwaPrakashan. New Delhi.
2. Cappuccino J.H and Sherman N. (2007). Microbiology- A Lab Manual. 7th edition. The Benjamin Publishing Company. Singapore.
3. Cooper G.M and Hausman R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C; Sinauer Associates, MA.
4. Karp G. (2010). Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley &Sons.Inc. New Jersey.

5. De Robertis EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.

6. Gunasekaran, P. (2008). Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi .

Web Resources

1. https://www.biocourseware.com
2. https://www.microbiologyonline.com
3. https://www.ncbinetwork.com
4. https://www.introduction to microbiology culture.m.youtube.com
5. https://www.practical microbiology.m.youtube.com

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

	Course Learning Outcomes	Knowledge Level
CLO1	Define the principles and application of instruments associated with microbiology.	Up to K1
CLO2	Describe the various methods for microbial control	Up to K2
CLO3	Elaborate the concepts of microbial cells in terms of growth, division, specialization, motility and interaction.	Up to K2
CLO4	Isolate and identify mutant colonies.	Up to K3
CLO5	Illustrate the mechanism of mitosis and meiosis. Isolate and estimate the genomic from bacterial cells.	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	1	2	2	1	3	2	1
CLO2	1	1	1	2	2	1	1
CLO3	1	2	1	1	3	1	1
CLO4	2	2	1	1	2	3	1
CLO5	1	1	2	1	2	2	2

Advance application–3; Intermediate level –2; Basic level –1

Mapping of course outcome with Programme outcome:

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	1	2
CLO2	1	3	1	1	2
CLO3	1	2	3	2	2
CLO4	2	3	1	1	2
CLO5	1	2	1	1	2

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Experiment Number	Description	Staff	Hours	Mode
1	**Principle, methods of sterilization and safety measures.** 1.1. Discuss laboratory safety guidelines (Rules and Regulations) and basic instrumental requirements. 1.2. Instructions for potential laboratory hazards (physical, chemical and microbiological) 1.3. Idea about specific types of sterilization (dry heat, moist heat, cold sterilization)		3	Lecturing and discussion
2	**Preparation of media.** 2.1. To understand media and its types. 2.2. To become familiar with media preparation . 2.3. To cultivate microorganisms.		3	Group lab work
3	**Pure culture techniques: streak plate, spread plate and pour plate.** 3.1. To purify microorganisms from mixed culture. 3.2. To learn different types of streaking techniques. 3.3. Isolate mutagenic or converted microorganisms by using differential new procedures.		3	Joint productive activity
4	**Motility determination-Hanging drop method.** 4.1. Study motility of bacteria. 4.2. Observe cell activities and binary fission. 4.3. Observe natural shape and size of the cells.		3	Visual learning and observation
5	**Isolation and identification of bacteria and fungi from different environmental samples.** 5.1. Isolate pathogenic bacteria and fungi from specimens. 5.2. Identify morphology and internal structures.		3	Retrieval hands-on learning practices
6	**Enumeration of bacteria-viable count (plate count) and total count (Haemocytometer count).** 6.1. To count number of bacterial and yeast cells.		3	Experimental learning
7	**Direct microscopic observation of fungal spores and mycelium.** 7.1. To visualize the structure of fungi under microscope. 7.2. To know the basic principles and theory of microscopes.		3	Microscopic instrumental learning.
8	**Staining methods: Simple, negative and capsule** 8.1. Differentiate bacteria based on shape and arrangements 8.2. Observe minute cells under microscope. 8.3. Understand the chemical and theoretical basics of differential staining procedures.		3	Practical demo learning
9	**Staining methods: Gram's staining and endospore staining.** 9.1. Differentiate bacteria based on shape and arrangements 9.2. Observe minute cells under microscope. 9.3. Understand the chemical and theoretical basics of differential staining procedures.		3	Practical demo learning

10	**Measurement of growth rate and generation time by turbidometry method.** 10.1. Measuring bacterial growth curve. 10.2. Estimate generation time of bacteria.		3	Conceptual teaching method
11	**Description of compound microscope and its parts.** 11.1. Understand nature and types of microscope. 11.2. Learn working principle and procedures of microscopes**.**		3	Demonstrative learning
12	**Mitosis in onion root meristem.** 12.1. Observe different stages of mitosis. Draw and calculate mitotic index.		3	Team based technical learning
13	**Chromosomal behaviour and Meiosis in flower bud-** *Rhoeo.sp***.** 13.1. Observe different stages of meiosis.		3	Test enhanced learning
14	**Isolation of chloroplast from spinach leaves.** 14.1. Observe and count chloroplast cells.		3	Understand and implement research activity learning
15	**Isolation of genomic DNA from bacterial cells and separation of isolated genomic DNA by agarose gel electrophoresis.** 14.1. To separate nucleic acids from crude extracts. 14.2. Learn the electrophoretic mobility of a molecule in agarose gel electrophoresis -depend on charge and pore size.		3	Challenging lab activity and visual learning
	Total	**45 Hours**		

Course designers:

1. **Dr. S. Sree Gayathri**

DEPARTMENT OF MICROBIOLOGY					CLASS: II B.Sc. Biotechnology			
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Allied	20U3RAC1	Basic Microbiology	4	4	25	75	100

Course Objectives:
   1. To impart basic knowledge on history of microbiology
   2. To learn and relate the structural variation among the micro-organisms.
   3. To emphasize the significance of beneficial microbes
   4. To enable the students to explore the methods for the control of pathogenic microbes.
   5. To understand various aspects of classical Microbiology and fundamental concepts in practical microbiological techniques,this forms the basis for any biotechnology application.

Unit-I: Introduction and History of Microbiology
Discovery of microorganisms- Contributions of Leeuwenhoek, Louis Pasteur, Edward Jenner , Robert Koch, Elie Metchnikoff and Fleming. Classification based on Carl Woese (The three domains) and Robert H. Whittaker (Five Kingdom system).

Unit-II: Structural organization and Staining of Microbes
Types of bacteria based on morphology and flagella, Ultrastructure of bacteria (eg.*E.coli*)- cell wall, cell membrane, flagella, fimbriae, capsule, pili, endospore and cysts. Staining techniques – Simple, differential and special staining; Fungal staining. Microscopy – parts, principle and working mechanism of Bright field and Dark field microscope.

Unit-III: Growth and Culturing Techniques
Nutritional requirements –factors affecting growth - determination of growth, growth curve - media and its types (natural, synthetic, selective, differential and enrichment media). Culture techniques –pure culture methods (direct plating, serial dilution technique, streak plate, spread plate, pour plate, stab culture, slant culture), anaerobic culture - preservation of cultures.

Unit-IV: Control of microbes
Sterilization, disinfection, sanitization, antisepsis. Physical methods- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Tyndallisation, Pasteurization. Chemical methods-Mode of action and uses of: halogen and halogen compounds, compounds of heavy metals, phenols and its derivatives, alcohol, detergents. Chemosterilant gases (formaldehyde, ethylene oxide, beta propiolactone)

Unit-V: Types of Microbes and their Economic Importance
General characteristics, morphology, ultra structure and economic importance of Algae – *Chlamydomonas* and *Anabaena.* Fungi- *Aspergillus niger*and *Saccharomyces cerevisiae.* Virus- HIV and T4 bacteriophage, Virions and Prions. Protozoa- *Amoeba*, *Plasmodium*.

Books for Study

1. Dubey RC and Maheswari DK (2005). A text book of Microbiology, Revised Multicolour Edition, Published by S. Chand & Company Limited, New Delhi.
2. Pelczar TR, Chan ECS and Kreig NR (2006) Microbiology. 5th Edition, Tata McGraw – Hill, New Delhi.

Books for Reference

1. Prescott M (2005). Microbiology. 6th Edition, Tata McGraw – Hill, New Delhi.
2. Albert G Moat and John W Foster (2004). Microbial Physiology. 4th Edition, John Wiley & Sons, New York.
3. Robert F Boyd (1984). General Microbiology. Times Mirror / Mosby College Publishers, UK.
4. Purohit SS (2005). Microbiology – Fundamentals and Applications. Reprinted & Published by Student Edition, Behind Nasrani Cinema, Chopasani Road, Jodhpur.
5. Schlegel, H.G., (1993).General Microbiology, Seventh edition, Cambridge University Press, UK.

Web Resources

1. https://www.periobasics.com/basic-microbiology.
2. https://www.microbiologynutsandbolts.co.basic-concepts.
3. https://www.microbiologyinfo.com/category/basic-microbiology
4. https://www. Microbiology - Overview -youtube.com
5. https://www. Introduction to microbiology. youtube.com

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO):

On completion of this course the students will be able to

	Course Learning Outcome	**Knowledge Level**
CLO-1	Explain the fundamental concepts; describe the history and development of microbiology.	Up to K2
CLO-2	Apply various staining techniques to differentiate and identify the microorganisms.	Up to K3
CLO-3	Identify the basic growth requirements of bacteria and demonstrate the practical skills in isolation, cultivation and preservation of microorganisms.	Up to K2
CLO-4	Apply suitable methodologies to control the growth of microbes by various sterilization techniques and by the use of other chemical agents	Up to K3
CLO-5	Compare and contrast the structural organization and economic importance of fungi, algae, viruses and protozoa.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CLO1	1	1	1	1	1	1	1
CLO2	3	2	1	3	3	1	1
CLO3	3	3	2	3	3	2	1
CLO4	3	3	2	3	3	2	1
CLO5	3	3	2	3	1	2	1

Advance application–3; Intermediate level –2; Basic level –1

Mapping of Course Outcome with Programme Outcome:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CLO1	3	1	1	1	1
CLO2	3	2	1	2	3
CLO3	3	3	3	3	3
CLO4	3	3	2	3	2
CLO5	3	3	2	3	1

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Units		Description	Staff	Hours	Mode
I **Introduction and History of Microbiology**	a)	Introduction, History of Microbiology, Discovery of microorganisms		2	Chalk and talk
	b)	Contributions of Leeuwenhoek, Louis Pasteur, Edward Jenner , Robert Koch, Elie Metchnikoff and Fleming		6	Screening of educational videos
	c)	Classification based on Carl Woese (The three domains) and Robert H. Whittaker (Five Kingdom system)		4	Chalk and talk
II **Structural organization and Staining of Microbes**	a)	Bacteria, types of bacteria based on morphology and flagella		2	PPT
	b)	Ultrastructure of bacteria (eg.*E.coli*)- cell wall, cell membrane, flagella, fimbriae, capsule, pili, endospore and cysts		3	Screening of educational videos
	c)	Staining techniques – Simple, differential and special staining; Fungal staining		4	Screening of educational videos
	d)	Microscopy – parts, principle and working mechanism of simple and compound microscope		3	PPT
III **Growth and Culturing Techniques**	a)	Growth of bacteria– nutritional requirements –factors affecting growth - determination of growth, growth curve		3	Chalk and talk
	b)	Media and its types (natural, synthetic, selective, differential and enrichment media)		3	Quiz
	c)	Culture techniques –pure culture methods (direct plating, serial dilution technique, streak plate, spread plate, pour plate, stab culture, slant culture)		4	Screening of educational videos
	d)	Anaerobic culture, preservation of cultures		2	Screening of educational videos
IV **Control of microbes**	a)	Sterilization, Disinfection, sanitization, antisepsis.		3	PPT
	b)	Physical methods- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Tyndallisation, Pasteurization.		4	Chalk and talk
	c)	Chemical methods-Mode of action and uses of: halogen and halogen compounds, compounds of heavy metals, phenols and its derivatives, alcohol, detergents. Chemosterilant gases (formaldehyde, ethylene oxide, beta propiolactone)		5	Chalk and talk
V **Types of Microbes and their Economic Importance**	a)	General characteristics, morphology, ultra structure and economic importance of Algae – *Chlamydomonas &Anabaena*		3	Seminar, Group discussion
	b)	General characteristics, morphology, ultra structure and economic importance of Fungi- *Aspergillus niger*and *Saccharomyces cerevisiae.*		3	Seminar, Group discussion
	c)	General characteristics, morphology, ultra structure and economic importance of Virus- HIV and T4 bacteriophage, Brief study on Virions and Prions		3	Seminar, Group discussion
	d)	General characteristics, morphology, ultra structure and economic importance of Protozoa- *Amoeba, Plasmodium*		3	Seminar, Group discussion
			Total	**60 Hours**	

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**50%**
K2	5	6	10	20	**41**	34.17	
K3	-	-	20	20	**40**	33.33	**33%**
K4	-	-	10	10	**20**	16.67	**17%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Course designers:

1. **Dr. P. Kiruthika Lakshmi**

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Biotechnology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Allied	20U4RAC2	Applied Microbiology	4	4	25	75	100

Course Objectives:

1. To understand the concept of microbial contamination and spoilage of foods and their preservation and microbiological production of foods.
2. To study beneficial microbes in soil and control of plant diseases.
3. To analyze the microbes in environment and water contamination.
4. To know the biopharmaceuticals and their production.
5. To identify the principles of industrially important microorganisms and the process of production of industrially important products.

Unit-I: Food Microbiology

Microorganisms of food spoilage and their sources. Contamination and Spoilage of different foods - fruits, vegetables, milk, meat, fish and canned foods. General account of food preservation. Microbiological production of fermented foods – bread, cheese, yogurt. Microorganisms as food – SCP.

Unit-II: Soil and Agricultural Microbiology

Soil microflora. Plant growth-promoting microorganisms. Biofertilizers –*Rhizobium,Azolla* and Mycorrhizae. Bacterial and fungal diseases of Plants – bacterial blight of rice, citrus canker, leaf spot of rice and rust of sorghum. Biopesticides – *Bacillus thuringiensis,* Nuclear polyhedrosis virus (NPV), *Trichoderma*.

Unit-III: Environmental Microbiology

Microbial interactions – mutualism, commensalism, antagonism, competition, parasitism, predation. Microbiology of potable and polluted waters. *E. coli* and *Streptococcus faecalis* as indicators of water pollution. Biogeochemical cycles-Nitrogen, Phosphorous and sulphur.

Unit-IV: Pharmaceutical Microbiology

Microbial drugs and edible vaccines. Biopharmaceuticals- source and production methods - cytokines, haemopoetic growth factors, hormones and therapeutic enzymes. Industrial production of antibiotics (penicillin).

Unit-V: Industrial Microbiology

Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes. Screening and isolation of industrially-important microorganisms. Industrial production of alcohols (ethyl alcohol), beverages (beer and wine), enzymes (amylases), and organic acids (citric acid).

Books for Study
1. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, Mc Graw Hill, New York.
2. Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
3. Subba Rao, N.S. (1999). Soil Microorganisms and Plant Growth. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
5. Vijaya Ramesh. K (2004). Environmental Microbiology. 1st Edition, MJP Publishers, Chennai

Books for Reference
1. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York.
2. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
3. Adams, M.R. and Moss, M.O. (1996). Food Microbiology, New Age International (P) Ltd, New Delhi.
4. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA
5. Banwart, G.J. (1987). Basic Food Microbiology, CBS Publishers and Distributors, New Delhi.
6. Cassida, L.E. (1968). Industrial Microbiology, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
7. Reed, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.

Web Resources
1. https://www.periobasics.com/basic-microbiology.
2. https://www.microbiologynutsandbolts.co.basic-concepts.
3. https://www.microbiologyinfo.com/category/basic-microbiology
4. https://www. Microbiology - Overview -youtube.com
5. https://www. Introduction to microbiology. youtube.com

Course Learning Outcomes (CLO):

On the completion of the course the student will be able to

	Course Learning Outcome	Knowledge Level
CLO1	Comprehend the concept of microbial contamination and spoilage of foods and their preservation and microbiological production of foods.	Up to K2
CLO2	Discuss beneficial microbes in soil and control plant diseases.	Up to K3
CLO3	Analyze the microbes in environment and water contamination.	Up to K4
CLO4	Distinguish the production of biopharmaceuticals and antibiotics.	Up to K3
CLO5	Categorize the microorganisms of industrial importance and industrial production of products.	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	2	1	1	1	2	1	1
CLO2	1	2	1	1	2	2	1
CLO3	2	1	1	2	1	1	1
CLO4	1	2	1	1	2	3	1
CLO5	2	1	2	3	2	1	2

Advance application–3; Intermediate level –2; Basic level –1

Mapping of Course Outcome with Programme Outcome:

	PO1	PO2	PO3	PO4	PO5
CLO1	3	3	1	2	3
CLO2	2	2	1	3	2
CLO3	3	2	1	3	3
CLO4	3	2	2	2	3
CLO5	3	2	2	3	3

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Units		Description	Staff	Hours	Mode
I **Food** **Microbiology**	a)	Microorganisms of food spoilage and their sources.		1	Chalk and Talk
	b)	Contamination and Spoilage of fruits,		1	
	c)	Contamination and Spoilage of vegetables,		1	
	d)	Contamination and Spoilage of milk,		2	
	e)	Contamination and Spoilage of meat,		1	
	f)	Contamination and Spoilage of fish		1	
	g)	Contamination and Spoilage of canned foods.		1	
	h)	General account of food preservation.		1	
	i)	Microbiological production of fermented foods – bread, cheese, yogurt.		2	
	j)	Microorganisms as food – SCP.		1	
II **Soil and** **Agricultural** **Microbiology**	a)	Soil microflora.		1	Chalk and Talk
	b)	Plant growth-promoting microorganisms.		1	
	c)	Biofertilizers –*Rhizobium*		2	
	d)	*Azolla*		1	
	e)	Mycorrhizae		2	
	f)	Bacterial diseases of Plants – bacterial blight of rice and citrus canker		1	
	g)	Fungal diseases of Plants –leaf spot of rice and rust of sorghum		1	
	h)	Biopesticides – *Bacillus thuringiensis*		2	
	i)	Nuclear polyhedrosis virus (NPV) and *Trichoderma*.		1	
III **Environmental** **Microbiology**	a)	Microbial interactions – mutualism, commensalism,		2	Chalk and Talk & PPT
	b)	Antagonism, competition, parasitism, predation.		2	
	c)	Microbiology of potable and polluted waters.		2	
	d)	*E. coli* and *Streptococcus faecalis* as indicators of water pollution.		2	
	e)	Biogeochemical cycles-Nitrogen,		2	
	f)	Phosphorous and sulphur cycles.		2	
IV **Pharmaceutical** **Microbiology**	a)	Microbial drugs and edible vaccines.		2	PPT & Chalk and Talk
	b)	Biopharmaceuticals- source and production method of cytokines,		2	
	c)	Source and production method of haemopoetic growth factors		2	
	d)	Source and production method of hormones		2	
	e)	Source and production method of therapeutic enzymes		2	
	f)	Industrial production of antibiotics (penicillin).		2	
V **Industrial** **Microbiology**	a)	Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes. Screening and isolation of industrially-important microorganisms.		3	PPT
	b)	Industrial production of alcohols (ethyl alcohol)		3	
	c)	Industrial production of beverages (beer and wine)		2	
	d)	Industrial production of enzymes (amylases)		2	
	e)	Industrial production of organic acids (citric acid).		2	
			Total	**60 Hours**	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Course designers:

    1. Mr. P. Sasikumar

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Biotechnology				
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III & IV	Allied	20U4RAP1	Ancillary Practical –I Lab In Basic Microbiology And Applied Microbiology	2	2	40	60	100

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

S.No	Experiments
1	Microscopic observation of bacteria –Simple and Differential staining
2	Examination of plant diseases – Bacterial and fungal diseases of Plants – bacterial blight of rice, citrus canker, leaf spot of rice and rust of sorghum (spotters)
3	Preparation of culture media –solid (selective and differential) and liquid
4	Isolation of single colonies on solid media – Slant, Streak –Simple and Quadrant
5	Sterilization methods – moist heat, dry heat, filtration and radiation.
6	Isolation of Nitrogen fixing bacteria from root nodules of legumes
7	Enumeration of bacteria from soil
8	MPN test.
9	Methylene Blue Reductase Test
10	Resazurin dye reduction test

Books for Study
1. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai.
2. James G Cappuccino & Natalie Sherman (2004). Microbiology: A Laboratory Manual. 6th Edition, Published by Pearson Education.

Books for Reference
1. Ashok, R. (2000). Antimicrobials in Laboratory Medicine, B.I. Churchill Livingstone. New Delhi.
2. Collee, J.G., A.G.Fraser, B.P.Marmion and A.Simmons (2007). Mackie and McCartney Practical medical Microbiology. Elsiever, New York.
3. Ranjan Kumar De, (2007). Diagnostic Microbiology, (For DMLT Students) Jaypee Brothers publishing, New Delhi.
4. Gunasekaran, P. (2008). Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi .

Web Resources
1. https://www.biocourseware.com
2. https://www.microbiologyonline.com
3. https://www.ncbionetwork.com
4. https://www.introduction to microbiology culture.m.youtube.com
5. https://www.practical microbiology.m.youtube.com

Course Learning Outcomes (CLO):

On completion of this course the students will be able to

CLO-1	Demonstrate the practical skills in the use of tools, technologies and methods common to microbiology.	Up to K2
CLO-2	Prepare various culture media, brief various physical and chemical means of sterilization. General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.	Up to K3
CLO-3	Experiment with microbial ecology and its interaction	Up to K3
CLO-4	Isolate and identify bacteria, fungi and algae	Up to K1
CLO-5	Determine the role of bacteria in environment and industrial processes.	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CLO1	1	2	2	1	2	1	1
CLO2	2	1	2	1	2	1	1
CLO3	2	1	2	2	2	1	2
CLO4	3	2	2	1	2	3	1
CLO5	2	1	2	3	2	3	1

Advance application–3; Intermediate level –2; Basic level –1

Mapping of course outcome with Programme outcome:

	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	3	1	3
CLO2	2	3	2	1	2
CLO3	2	2	3	2	3
CLO4	3	3	2	1	2
CLO5	2	2	3	3	3

Advance application–3; Intermediate level –2; Basic level –1

Lesson Plan:

Experiment Number	Description	Staff	Hours	Mode
1	**Staining methods: Simple, negative, capsule, Gram's staining and endospore staining.** 1.1. Differentiate bacteria based on shape and arrangements 1.2. Observe minute cells under microscope. 1.3. Understand the chemical and theoretical basics of differential staining procedures.		3	Practical demo and learning
2	**Examination of plant diseases – Blast disease in paddy, Blight of rice** 2.1. Observe and identify disease parts of plants.		3	Practical demo learning
3	**Preparation of media.** 1.1. To understand media and its types. 1.2. To become familiar with media preparation (agar plate, slant, broth) . 1.3. To cultivate microorganisms.		3	Group lab work
4	**Pure culture techniques: streak plate, spread plate and pour plate.** 4.1. To purify microorganisms from mixed culture. 4.2. To learn different types of streaking techniques. 4.3. Isolate mutagenic or converted microorganisms by using differential new procedures.		3	Joint productive activity
5	**Principle, methods of sterilization and safety measures.** 5.1. Discuss laboratory safety guidelines (Rules and Regulations) and basic instrumental requirements. 5.2. Instructions for potential laboratory hazards (physical, chemical and microbiological) 5.3. Idea about specific types of sterilization (dry heat, moist heat, cold sterilization)		3	Lecturing and discussion
6	**Isolation of Nitrogen fixing bacteria from root nodules of legumes** 6.1. Isolate bacteria from root nodules. 6.2. Identify morphology.		3	Group lab work
7	**Enumeration of bacteria from soil** 7.1. Isolate soil bacteria 7.2. Enumerate and Identify morphology.			Group lab work
8	**MPN test.** 8.1. Prepare media and Sterilize 8.1.1. Inoculate and Incubate 8.1.2. Observe the results		3	Group lab work
9	**Methylene Blue Reductase Test** 9.1. Add Sample and Dye 9.2. Incubate 9.3. Observe results		3	Group lab work
10	**Resazurin dye reduction test** 10.1. Add Sample and Dye 10.2. Incubate 10.3. Observe results		3	Group lab work
		Total	**30 Hours**	

Course designers

    1. Dr. S. Sree Gayathri

DEPARTMENT OF MICROBIOLOGY				Certificate Course				
Course Type	Course Code	Course Code Course Title	Credits	Total Contact Hours	CIA	Ext	Total
Certificate Course	CRC01	Mushroom Technology	2	30	25	75	100

Course Objectives:
1. To teach to the students knowledge and skills, which allow them to establish a mushroom cultivation enterprise
2. To study different cultivation methods of mushroom
3. To understand the biology and nutritional value of mushroom
4. To learn the application of mushroom technology in commercial and therapeutic field
5. To know about pathogenesis of different bacterial, fungal diseases of mushroom and post harvest technology
6. Learn a means of self-employment and income generation

Unit-I: Introduction to Mushroom Cultivation
Mushroom – Introduction-Taxonomical rank -History and Scope of mushroom cultivation -Mushroom edible types – Its natural growth aspects and climatic requirement –Selection of Mushroom cultivation sites – Role of composting in mushroom cultivation – Preparation of different types of compost – Key to differentiate edible from poisonous mushrooms.

Unit-II: Biology of Mushrooms
Button mushroom (*Agaricusbisporus*), Milky mushroom (*Calocybeindica*), Oyster mushroom (*Pleurotussajorcaju*) and paddy straw mushroom (*Volvariellavolvcea*) - General morphology, distinguishing characteristics, spore germination and life cycle – Nutritional and calorific values of mushroom. Health benefits of mushroom. Therapeutic aspects- antitumor effect.

Unit-III: Cultivation system and Farm design
Fundamentals of cultivation system – Small unit and larger commercial unit – Principles of mushroom shed layout – location of building plot, design of farm, bulk chamber, composting platform, equipments and facilities, pasteurization room and growing rooms.

Unit-IV: Spawn and Spawning
Facilities required for spawn preparation, preparation of spawn and substrates, preparation of pure culture and maintenance, storage of spawn. Importance of casing mixture, quality parameters of casing soil, different types of casing mixtures, commonly used materials.

Unit-V: Diseases and Harvest technology
Insect pests, nematodes, mites, viruses, fungal competitors and other important diseases. Methods of harvesting of mushroom – packaging, storing and grading of Mushrooms – Post harvest technology – freezing , dry freezing, drying , canning, quality assurance. Value added products of mushrooms. Preparation of mushroom recipes. Guidelines to become entrepreneur.

Training/ Workshop/ Field visit

Mushroom farm – Set up, Sterilization and Sanitation of mushroom house – shed, instruments etc. Preparation of mushroom beds – Composts, Paddy straw, sugarcane trash, maize straw, banana thrash and vegetable wastes, Preparation of spawn under controlled conditions (Preparation of mother spawn in saline bottle and polypropylene bag and theirmultiplication), Cultivation of oyster mushroom, Harvesting and Packing of mushroom – Marketing, Diseases of mushrooms(photographs), Preparation of mushroom recipes – Mushroom biryani, mushroom munchurian, mushroom omelette, mushroom soup, mushroom fried rice, mushroom 65. Visit to relevant Labs / FieldVisits.

Books for Study

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.

Books for Reference

1. Aneja, K.R. (1993). Experiments in Microbiology, Plant pathology, Tissue culture and mushroom cultivation, WishwaPrakashan, New Age International (P) Ltd., New Delhi.
2. Chang,S. and Miles, P.G. (2004). Mushrooms: Cultivation, Nutritional Value, Medicinal Effect, and Environmental Impact, CRC Press online.
3. Mushroom Cultivation, Tripathi, D.P.(2005) Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi.
4. Pathak, V.N. Nagendra Yadav and ManeeshaGaur,(2000) Mushroom Production and Processing Technology/ VedamsEbooks Pvt Ltd., New Delhi.

Web Resources

1. https://www.mushroomcouncil.com/...mushrooms/six-steps-to-mushroom-farming
2. https://www.krishisewa.com/articles/.../46-technology-for-mushroom-cultivation.
3. https://www.indiamart.com › Vocational Education and Training
4. https://www. Mushroom Production Technology -youtube.com
5. https://www. .mushroom cultivation- youtube.com

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course designers

1. Mrs. K. Rajeswari
2. Dr. A.P. Asha Kannan

Department of Biotechnology

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Academic Year 2020-2021 onwards

The Madura College, Madurai
Department of Biotechnology

Vision

To produce disciplined and competent students of high calibre, to become socially committed and ethically strong to meet the challenges.

Mission

- To foster excellence in the field of biotechnology.
- To adopt proper pedagogical methods to ensure quality education and academic excellence.
- To provide conducive environment for learning following ethical, moral and spiritual values.

Programme Educational Objectives (PEOs)

The objectives of this programme

PEO-1	Exhibit practical and theoretical knowledge essential for pursuing higher studies
PEO-2	Elaborate basic and advanced laboratory skills necessary for Biotechnology.
PEO-3	Pursue careers in Pharmaceutical and Food Industry etc, and skills required to employ in a biotechnology laboratory or manufacturing facility
PEO-4	Aware of lifelong learning following ethics for professional practice.
PEO-5	Acquire theoretical and practical skills to develop biotech process to meet the demand.

Programme Specific Outcomes (PSOs)

On the successful completion of B.Sc., Biotechnology the students will be able to

	PSOs	Graduate Attributes
PSO-1	Infer knowledge in core concepts, recent developments and laboratory skills in various domains of biotechnology.	- Knowledge on core competency - Modern Tool Usage
PSO-2	Identify the various biological processes in prokaryotic and eukaryotic organisms.	Life-long learning
PSO-3	Make use of skills in biological and computational tools and techniques.	- Design - Problem analysis
PSO-4	Correlate and apply biological and chemical techniques in various areas of Biotechnology.	- Problem analysis - Conduct investigations of complex problems
PSO-5	Apply physio-chemical, biological & computational principles in the field of Biotechnology	- Design & Development of solutions for complex problems - Problem analysis - Modern Tool Usage
PSO-6	Exhibit in depth knowledge in various thrust areas of Biotechnology so as to meet the demands in industry and academia.	- Individual and team work - Communication - Life-long learning
PSO-7	Explain the importance of ethics and socio-economic development through Biotechnology.	- Ethics - Environment and sustainability

Department of Biotechnology
The Madura College
Madurai

OBE Programme structure for B.Sc., Biotechnology (2020 onwards)

Semester	Subject Code	Paper	Title of the paper	Hours/ week	Credits
I		Language-I		6	3
		English-I		6	3
		VE & PE	Value Education and Professional Ethics	3	3
		Ancillary-I Theory 1		4	4
		Ancillary-I Practicals		2	-
	20U1LMC1	Major Core-1	Genetics	3	3
	20U1LMC2	Major Core-2	Basics of Biotechnology	3	3
		Major Practicals-I*		3	-
				30	19
II		Language-II		6	3
		English-II		6	3
		E & GS	Environmental and Gender Studies	3	3
		Ancillary-I Theory 2		4	4
		Ancillary-I Practicals		2	2
	20U2LMC3	Major Core-3	General Physiology	3	3
	20U2LMC4	Major Core-4	Bioinstrumentation	3	3
	20U2LMP1	Major Practicals-I*	Lab in Genetics, Physiology, Biotechnology and Bioinstrumentation	3	3
		Extension			1
				30	25
III		Language-III		6	3
		English-III		6	3
	20U3LNM1	NME-I	Introduction to Biotechnology	2	2
	20U3LSM1	SBE-I	Biophysics and Bioenergetics	2	2
		Ancillary-II Theory 1		4	4
		Ancillary-II Practicals		2	-
	20U3LMC5	Major Core-5	Biochemistry	5	5
		Major Practicals-II*		3	-
				30	19
IV		Language-IV		6	3
		English-IV		6	3
	20U4LNM2	NME-II	Applied Biotechnology	2	2
	20U4LSM2	SBE-II	Food Processing and Preservation	2	2
		Ancillary-II Theory 2		4	4
		Ancillary-II Practicals		2	2
	20U4LMC6	Major Core-6	Cell and Molecular Biology	5	5
	20U4LMP2	Major Practicals-II*	Lab in Biochemistry, Cell biology, Molecular Biology and Food processing	3	3
				30	24

V	20U5LSM3	SBE-III	Bioethics, Biosafety and IPR	2	2
	20U5LMC7	Major Core-7	Immunology	5	5
	20U5LMC8	Major Core-8	Industrial Biotechnology	5	5
	20U5LMC9	Major Core-9	Plant Biotechnology	5	5
	20U5LME1	Major Elective-I#		4	4
	20U5LME2	Major Elective-II#		3	3
		Major Practicals-III*	Lab in Plant, Animal and Industrial Biotechnology	3	-
		Major Practicals-IV*	Lab in Immunology and Biostatistics	3	-
				30	24
VI	20U6LSM4	SBE-IV	Nanobiotechnology	2	2
	20U6LMC10	Major Core-10	Environmental Biotechnology	5	5
	20U6LMC11	Major Core-11	Recombinant DNA Technology	5	5
	20U6LMC12	Major Core-12	Medical Biotechnology	5	5
	20U6LME3	Major Elective-III#		4	3
	20U6LME4	Major Elective-IV#		3	3
	20U6LMP3	Major Practicals-III*	Lab in rDNA technology and Medical Biotechnology	3	3
	20U6LMP4	Major Practicals-IV*	Lab in Environmental Biotechnology and Bioinformatics	3	3
				30	29

#Elective Papers for B.Sc., Biotechnology

Semester	Paper	Title of the paper
V	Major Electives I & II	Biostatistics
		Animal Biotechnology
		Forensic Biotechnology
		Pharmaceutical Biotechnology
VI	Major Electives III & IV	Genomics & Proteomics
		Bioinformatics
		Microbial Biotechnology
		Marine Biotechnology

Ancillary Biotechnology Papers for B.Sc., Microbiology

Semester	Subject Code	Paper	Title of the paper	H	C
III	20U3LAC1	Ancillary-I Theory	Concepts in Biotechnology	4	4
		Ancillary-I Practicals*	Lab in Biotechnology - I	2	-
IV	20U4LAC2	Ancillary-II Theory	Biotechnology in Human Welfare	4	4
	20U4LAP1	Ancillary-II Practicals*	Lab in Biotechnology-II	2	2

Certificate Course

Semester	Title of the paper	H	C
	Clinical Laboratory Technology	30	

*External examination will be conducted in the even semester

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Core-1	20U1LMC1	Genetics	3	3	25	75	100

Course Objectives:
1. To apply the principles of inheritance as formulated by Mendel.
2. To understand principles of extensions to Mendelian inheritance, including multiple alleles, lethal alleles, gene interactions, and sex-linked transmission.
3. To describe the cause and consequences of alterations in chromosome number and/or structure.

UNIT-I: Mendelian Inheritance
Historical Background of Genetics. Definition –alleles, homozygous and heterozygous, back cross, test cross and reciprocal cross. Mendel's laws and his experiments –Law of dominance, segregation and independent assortment – Experiments in pea plants. Multiple alleles – ABO Blood groups and Rh factor. Multiple gene inheritance – Skin colour in man, Kernel colour in wheat.

UNIT-II: Deviations from Mendelism
Gene Interactions: complete and incomplete dominance, co-dominance and epistasis. Inter allelic-Complementary gene interaction (9:7) – *Lathyrus odoratus*, Supplementary gene interaction (9:3:4) Grain color in Maize, Epistasis - Dominant - Fruit color in *Cucurbita pepo*, Recessive - Coat color in Mice. Non-Epistasis - Comb pattern in Poultry

UNIT-III: Sex determination, sex-linked and cytoplasmic inheritance
Genetic balance theory of Bridges, Environment and Sex determination - *Drosophila*, Hormonal control of sex determination. Sex linked inheritance and sex influenced inheritance. Cytoplasmic inheritance - Kappa particles in *Paramecium*, shell coiling in snail and plastid inheritance in *Mirablis*

Unit-IV: Linkage and Crossing Over
Linkage: Theory and types of Linkage, linkage groups, factors affecting linkage, Crossing over -mechanism, factors affecting crossing over, tetrad analysis and significance of crossing over.

UNIT-V: Chromosomal aberrations and Population genetics
Chromosomal mutations – types: changes in number and structure, Karyotyping, Non-disjunction - Down syndrome, Klinefelter's syndrome and Turner's syndrome. Eugenics: Positive and Negative Eugenics, Pedigree analysis. Allelic and genotype frequencies, Hardy Weinberg law, factors affecting Hardy Weinberg law, Significance in Population Genetics.

Books for Study
1. Verma PS and Agarwal VK. 2008. Genetics. Eighth Edition. S. Chand Publications
2. Singh BD. 2002. Genetics. Kalyani Publications

Books for Reference
1. Snustad and Simmons. 2012. Principles of Genetics. John Wiley & Sons, Inc.
2. Klug and Cummings. 2012. Concepts in Genetics. Pearson
3. Brooker RJ. 2012. Genetics-Analysis & Principles. The McGraw-Hill Companies, Inc.
4. Sinnott, Dunn and Dobzhansky. Principles of Genetics.

Web Resources
1. http://www.gwumc.edu
2. http://nptel.ac.in
3. http://swayam.gov.in

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments and group discussions and Problem solving

Course Learning Outcomes:

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Identify the laws of inheritance	Up to K-3
CLO-2	Compare and contrast Mendelian inheritance and Non Mendelian Inheritance	Up to K-3
CLO-3	Interpret the inheritance pattern in both plants and animals	Up to K-4
CLO-4	Comprehensive and detailed understanding of Population Genetics	Up to K-2
CLO-5	Apply reasoning skills to solve genetic problems	Up to K-4

Mapping of Course outcomes with Program specific Outcomes:

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	3	1	1	1	--	3
CLO-2	3	2	1	2	2	--	--
CLO-3	3	3	2	2	1	2	--
CLO-4	3	3	3	3	2	1	--
CLO-5	3	3	3	2	2	3	2

Advance application-3; Intermediate level-2; Basic level-1

Mapping of Course outcomes with Program Outcomes:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	3	--	3	2
CLO-2	2	--	1	--	3
CLO-3	3	3	1	2	3
CLO-4	1	2	2	2	1
CLO-5	3	2	2	2	3

Advance application-3; Intermediate level-2; Basic level-1

LESSON PLAN

Unit	Description	Staff Name	Hours	Mode
UNIT - I	Historical Background of Genetics. alleles, homozygous and heterozygous, back cross, test cross and reciprocal cross		3	Chalk and talk Problem solving
	Mendel's laws and his experiments –Law of dominance, segregation and independent assortment – Experiments in pea plants.		3	Chalk and talk Problem solving
	Multiple alleles – ABO Blood groups and Rh factor in human beings, Multiple gene inheritance – Skin colour in man, Kernelcolour in wheat.		3	Chalk and talk Problem solving
UNIT - II	Gene Interactions: complete and incomplete dominance, co-dominance and epistasis.		3	Chalk and talk Problem solving
	Inter allelic-Complementary gene interaction (9:7) – *Lathyrus odoratus*, Supplementary gene interaction (9:3:4) Grain color in Maize.		3	Chalk and talk
	Epistasis - Dominant - Fruit color in *Cucurbita pepo*, Recessive - Coat color in Mice. Non-Epistasis - Comb pattern in Poultry.		3	Chalk and talk
UNIT - III	Genetic balance theory of Bridges, Sex determination- *Drosophila*		3	Chalk and talk
	Sex linked inheritance and sex influenced inheritance.		3	Chalk and talk
	Cytoplasmic inheritance – Kappa particles in *Paramecium,* shell coiling in snail and plastid inheritance in *Mirablis*		3	Chalk and talk PPT
UNIT-IV	Linkage theory: Coupling and repulsion, types of Linkage, linkage groups.		4	Chalk and talk PPT
	Crossing over – Mechanism, factors affecting crossing over, tetrad analysis and significance of crossing over.		5	Chalk and talk
UNIT - V	Chromosomal mutations – types: changes in number and structure, Karyotyping, Non-disjunction Down syndrome, Klinefelter's syndrome and Turner's syndrome		3	Chalk and talk
	Eugenics: Positive and Negative Eugenics, Pedigree analysis.		3	Chalk and talk Problem solving
	Allelic and genotype frequencies, Hardy Weinberg law, factors affecting Hardy Weinberg law, Significance in Population Genetics		3	Chalk and talk Problem solving

Blue Print – Genetics Course

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2.	CLO 2	Up to K 4	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K3 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K2 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Course content designed by Dr. N. Krithiga

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Core-2	20U1LMC2	Basics of Biotechnology	3	3	25	75	100

Course Objectives:
1. To introduce basic concepts of Biotechnology to the students.
2. To make students aware of tools and techniques of Biotechnology.
3. To motivate the students to aspire for research/industrial career in the field of Biotechnology.
4. To make students aware of bioethics and judicial usage of biotechnological applications.

UNIT-I: History and Gene concept
History of Biotechnology – traditional - ghee, butter, fermentation - curd, idli, wine and modern approaches - pasteurization, vaccination, biofuels, and GM crops. Central dogma - gene, RNA, protein-mutability of DNA - types of mutation, mutagens, mutagenesis, Ames test.

UNIT-II:Tools of Biotechnology
Organism of interest in Biotechnology - *Escherichia coli*. Restriction enzymes-types, naming, target sites, cohesive and blunt end, DNA methylases, DNA ligases. Plasmids - origin of replication, copy number, selection markers-antibiotic resistance genes. Types of vectors – Cloning: pBR 322, pUC, Expression Vectors and Shuttle vectors.

UNIT-III: Microbial and animal biotechnology
Experimental models - *Saccharomyces cerevisiae,* zebrafish and mice. Gene transfer methods - transformation, electroporation, gene gun. Engineered microbes - production of alcohol, amino-acids and proteins. Animal cell culture - stem cells - pluripotentcy. Construction of transgenic mice - gene knockout, gene silencing - gene transfer. Construction of genetically engineered sheep - Dolly.

UNIT-IV:Plant and Environmental biotechnology
Plant tissue culture - callus, totipotentcy. *Agarobacterium tumifaciens*- crown gall, Ti-plasmid, T-DNA transfer. Genetically engineered plants-pest resistant plant - *Bacillus thuringiensis*- Bt toxin. Environmental pollution and threat - Xenobiotics, biomagnification. Bioremediation - *In-situ* and *Ex situ*. Heavy metal bioremediation - microbes, phytoremediation - *Brassica juncea* and *Ambrosia* sp.

UNIT-V: Medical Applications and Bio-ethics
In-vitro fertilization - test tube baby. Gene therapy - adenosine deaminase - SCID. Diagnosis of diseases and disorders - FISH. Recombinant vaccines. Patent: definition and form of patent, patent rights, patent filing. Ethics- construction and usage of genetically engineered microbes, plants, animals-drug trials.

Books for Study
1. Satyanarayana. U. 2009. Biotechnology. Books and Allied Pvt. Ltd.
2. **Kumaresan. 2015. Biotechnology. Saras Publications.**

Books for Reference
1. Brown TA. 2012. Gene Cloning and DNA Analysis- An Introduction. Wiley Blackwell.
2. Balasubramaniam D, CFA Bryce, K Dharmalingam, J Green, Kunthala Jayaraman. Concepts in Biotechnology, University Press Reference Book.
3. Primrose SB and Twyman R. Principles of Gene Manipulation and Genomics, Blackwell.
4. Dubey RC. 2012. A textbook of Biotechnology, S. Chand Publications.

Web Resources
1. http://dbtindia.gov.in/
2. http://www.brsi.in/
3. https://www.easybiologyclass.com/topic-biotechnology/

Pedagogy
 The teaching methods may include Chalk and talk, PowerPoint, assignments, group discussions and quiz.

Course Learning Outcomes:
On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Elaborate with the history of biotechnology and understand the gene concept	Up to K-2
CLO-2	Develop knowledge on the principles and applications of essential biotechnological tools and methods	Up to K-3
CLO-3	Dissect the methods and applications of microbial and animal biotechnology	Up to K-4
CLO-4	Identify the applications and values of plant and environmental biotechnology strategies	Up to K-3
CLO-5	Analyze the merits and demerits of biotechnological applications	Up to K-4

Mapping of Course outcomes with Program specific Outcomes:

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	1	2	1	2	1	--	-
CLO-2	3	1	3	2	2	1	--
CLO-3	2	3	2	3	2	--	--
CLO-4	3	2	3	2	2	3	3
CLO-5	1	2	2	3	3	--	2

Advance application-3; Intermediate level-2; Basic level-1

Mapping of Course learning outcomes with Program Outcomes:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	--	2	2	--
CLO-2	3	3	2	2	3
CLO-3	3	2	2	--	3
CLO-4	3	2	2	3	--
CLO-5	3	3	2	3	--

Advance application-3; Intermediate level-2; Basic level-1

LESSION PLAN

Unit-I	Description	Staff Name	Hours	Mode
I	History of Biotechnology – traditional and modern approaches		3	Chalk & Talk
	Central dogma – gene, RNA, protein		3	Chalk & Talk Discussion
	Types of mutations,types of mutagens, mutagenesis, Ames test		3	Chalk & Talk Discussion
II	Organism of interest in Biotechnology - *Escherichia coli*.		3	Chalk & talk, PPT
	Restriction enzymes-types, naming, target sites, cohesive and blunt end, DNA methylases, DNA ligases.		3	Discussion & PPT
	Types of vectors – Cloning: pBR 322, pUC, Expression Vectors and Shuttle vectors.		3	Chalk & Talk
III	Experimental models - *Saccharomyces cerevisiae,* zebrafishand mice.		1	Chalk & Talk
	Gene transfer methods - transformation, electroporation, gene gun.		2	PPT & Discussion
	Engineered microbes - production of alcohol, amino-acids and proteins. Animal cell culture - stem cells – pluripotentcy.		3	Chalk & Talk
	Construction of transgenic mice - gene knockout, gene silencing - gene transfer. Construction of genetically engineered sheep – Dolly.		3	Chalk & Talk
IV	Plant tissue culture - callus, totipotentcy. *Agarobacteriumtumifaciens-* crown gall, Ti-plasmid, T-DNA transfer.		2	Chalk & Talk
	Genetically engineered plants-pest resistant plant - *Bacillus thuringiensis*- Bt toxin.		2	PPT & Discussion
	Environmental pollution and threat - Xenobiotics, biomagnification.		2	Chalk & Talk & PPT
	Bioremediation - *In-situ* and *Ex situ*. Heavy metal bioremediation - microbes, phytoremediation - *Brassica juncea* and *Ambrosia* sp.		3	Chalk & Talk & PPT
V	*In-vitro* fertilization - test tube baby. Gene therapy - adenosine deaminase - SCID.		3	Chalk & Talk
	Diagnosis of diseases and disorders - FISH. Recombinant vaccines.		3	Chalk & Talk & Discussion
	Patent: definition and form of patent, patent rights, patent filing. Ethics- construction and usage of genetically engineered microbes, plants, animals-drug trials		3	Chalk & Talk & Discussion
			45h	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Basics of Biotechnology Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short Answers No. of Questions	Section B Short Answers K-Level	Section C (Either / or Choice)	Section D (Open Choice)
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 4	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K2 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-IV (K3 Level)	1Question from Unit-IV (K4 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving Problems
K4 – Examining, analyzing, presentation and make interferences with evidences

Course content designed by Dr. N. Arul Muthu Kumaran

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Core-3	20U2LMC3	General Physiology	3	3	25	75	100

Course Objectives:
1. To learn the basics of physiological processes in both plant and animals
2. To understand adaptive mechanisms against various stress conditions
3. Apply the physiological processes in the field of Biotechnology
4. Describe significance of physiological processes
5. Motivate the students to explore interaction between internal systems

Unit-I: Organization of Animal and plant tissue
Animal tissues – Types, Structure and functions of Epithelial, Connective, Muscle and Nervous tissues, Plant tissues – Types, Structure and functions of Ground (Parenchyma, Collenchyma & Sclerenchyma), Vascular (Xylem & Phloem) & Dermal (Epidermis & Periderm)

Unit-II: Transportation in Plant and Animal Digestion
Water Potential, Diffusion, Osmosis.Water absorption – apoplast and symplast. Active and passive, transport in xylem and Phloem. Structure & functions of digestive glands, Digestion and absorption of carbohydrates, proteins and lipids and its regulation

Unit-III:Respiration & Circulation
Respiratory organs - Tracheal system, gills and lungs, Transport of gases, respiratory pigments, Hemoglobin as oxygen carrier, respiratory quotient; Mechanism of gas exchange in tissues. Circulation - Open and closed system, components and functions of blood, mechanism of circulation, blood clotting mechanism

Unit-IV: Transpiration and Excretion
Transpiration - stomata opening and closing- Mechanism and hormonal regulation. Excretion - Excretory organs in animals, excretory products; structure and functions of human kidney, mechanism of urine formation. Dysfunction of kidney - renal failure, diagnosis and treatment.

Unit-V: Neural System & Endocrine System
Nervous system - CNS and ANS; neurons; propagation of nerve impulses - synaptic transmission. Reflex action and reflex arc, structure and physiology of hearing and vision. Endocrine system - structure and function of endocrine glands (pituitary, thyroid parathyroid, adrenal glands, Islets of Langerhans, thymus), Mode of action of hormones.

Books for Study
1. Mohan Arora. 2008. Animal Physiology. Himalya Publications
2. Russell JP. 2008. Plant and Animal Physiology. Brooks & Cole Publications

Books for References

1. Moyes. 2011. Principles of Animal Physiology. Pearson publications
2. Brooker RJ. 2011. Biology. The McGraw-Hill Companies, Inc
3. Hoar. WS. 2004. General and Comparative Physiology. 3rd Edition. Prentics-Hall of India.
4. Bidlack JE &Jansky SH. 2011. Stern's Introductory Plant Biology. The McGraw-Hill Companies, Inc.

Web Resources

1. https://www.edx.org/xseries/harvardx-fundamentals-of-neuroscience
2. http://www.mblab.gla.ac.uk/~julian/DowLab.html

Pedagogy

The teaching methods may includeChalk and talk, PowerPoint, demonstrations through video, assignments and group discussions

Course Learning Outcomes:

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Illustrate the structural organization of various systems within an animal body	Up to K-2
CLO-2	Explain the functions of various organ systems	Up to K-4
CLO-3	Classify the role of hormones in physiological process`es	Up to K-4
CLO-4	Correlate interaction between various organ system	Up to K-4
CLO-5	Categorize the signal transduction mechanism	Up to K-4

Mapping of Course outcomes with Program specific Outcomes:

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	1	2	1	3	1	--	--
CLO-2	1	3	2	2	1	2	--
CLO-3	2	3	1	2	2	3	--
CLO-4	3	3	1	2	1	--	--
CLO-5	2	2	3	2	1	3	2

Advance application-3; Intermediate level-2; Basic level-1

Mapping of Course learning outcomes with Program Outcomes:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	--	2	--	--
CLO-2	3	2	2	--	--
CLO-3	3	2	2	3	--
CLO-4	3	2	2	3	--
CLO-5	3	--	3	1	--

Advance application-3; Intermediate level-2; Basic level-1

LESSION PLAN

Unit-I	Description	Staff Name	Hours	Mode
I	Animal tissues – Types, Structure and functions of Epithelial, Connective, Muscle and Nervous tissues,		4	PPT & Discussion
	Plant tissues – Types, Structure and functions of Ground (Parenchma, Collenchyma & Sclerenchyma), Vascular (Xylem & Phloem) & Dermal (Epidermis & Periderm)		5	PPT & Discussion
II	Water Potential, Diffusion, Osmosis. Water absorption – apoplast and symplast.		2	Chalk & Talk & Demonstration
	Active and passive, transport in xylem and Phloem.		2	Chalk & Talk
	Structure & functions of digestive glands		2	Chalk & Talk & PPT
	Digestion and absorption of carbohydrates, proteins and lipids and its regulation		3	Chalk & Talk & Discussion
III	Respiratory organs - Tracheal system, gills and lungs, Transport of gases, respiratory pigments.		2	PPT & Discussion
	Hemoglobin as oxygen carrier, respiratory quotient.		3	PPT & Discussion
	Mechanism of gas exchange in tissues. Circulation - Open and closed system.		2	Chalk & Talk
	Components and functions of blood, mechanism of circulation, blood clotting mechanism.		2	PPT & Discussion
IV	Transpiration - stomata opening and closing- Mechanism and hormonal regulation.		3	Chalk & Talk
	Excretion - Excretory organs in animals, excretory products; structure and functions of human kidney.		3	Chalk & Talk
	Mechanism of urine formation. Dysfunction of kidney - renal failure, diagnosis and treatment.		3	PPT & Discussion
V	Nervous system - CNS and ANS; neurons; propagation of nerve impulses - synaptic transmission.		2	Chalk & Talk
	Reflex action and reflex arc, structure and physiology of hearing and vision.		3	PPT & animation
	Endocrine system - structure and function of endocrine glands (pituitary, thyroid parathyroid, adrenal glands, Islets of Langerhans, thymus), Mode of action of hormones.		4	Chalk & Talk
			45h	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – General Physiology Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs No. of Questions	Section A MCQs K-Level	Section B Short Answers No. of Questions	Section B Short Answers K-Level	Section C (Either / or Choice)	Section D (Open Choice)
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 4	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	**42%**
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K2 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-IV (K4 Level)	1Question from Unit-III (K3 Level)
		2 Questions from Unit-V (K3 Level)	1Question from Unit-V (K4 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Course content designed by Dr. P. Vimal

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Core-4	20U2LMC4	Bioinstrumentation	3	3	25	75	100

Course Objectives

1. To introduce students to various analytical instrumentation used in biotechnology labs.
2. To understand the physical principles of emerging bio-analytical techniques.
3. To identify and interpret results of bio-analytical techniques.
4. To critically assess the advances in the field of bio-analytical chemistry

Unit-I: Microscopy

Microscopy: Introduction –magnification, resolving power and numerical aperture and types - bright field, dark field, Phase contrast, Fluorescence, Polarising microscopy; Electron microscopy- SEM and TEM.

Unit-II: pH meter and Centrifuge

pH meter: Principle, working and applications. Centrifuge: Basic principles of Sedimentation- types of centrifuges and types of rotors. Mechanism of diffusion and sedimentation.

Unit-III: Colorimetry and Spectroscopy

Colorimetry: Beer - Lambert's Law – principle and applications; Spectrophotometry - UV, Visible, Fluorescence and Infrared spectroscopy –principle, instrumentation and applications.

Unit-IV: Chromatography

Chromatography: Paper Chromatography; Thin layer Chromatography; Gas chromatography, ion exchange, High pressure Liquid Chromatography- principle, instrumentation and applications.

Unit-V: Electrophoresis and Radio-activity

Electrophoresis: Types-moving boundary and zone electrophoresis. Techniques and applications of Agarose gel electrophoresis, native PAGE, SDS-PAGE- principle, instrumentation and applications. Radio isotope techniques: natural radiations, nature of radioactivity – Detection and measurement of radioactivity –- Geiger-Muller counter– Autoradiography Applications of radioisotopes in Biological sciences – Hazards and containment of radioactivity.

Books for Study

1. Jeyaraman J. 1985. Laboratory Manual in Biochemistry.Wiley Eastern Limited, New Delhi.
2. Plummer D. 1987. An Introduction to Practical Biochemistry. Tata McGraw – Hill Publishing Company Ltd., New Delhi.
3. Veerakumari L. 2009. Bioinstrumentation. MJP publishers.

Books for Reference

1. Wilson, K and Walker,J, Principles and Techniques of Practical Biochemistry, 1995, Cambridge University Press, New York.
2. Boyer, R.F., Modern Experimental Biochemistry, 1993,The Benjamin / Cummings Publishing Company, Inc., New York.
3. Switzer RL, Garrity LF. 1999. Experimental Biochemistry. W. H. Freeman and Co.

Web Resources
1. http://nptel.ac.in
2. http://swayam.gov.in

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, Assignments and group discussions, Problem solving

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Explain the principle, components and application of different types of microscopes.	Up to K-2
CLO-2	Infer the principle, working and applications of different centrifuges and pH meter	Up to K-4
CLO-3	Apply the concept of electromagnetic radiation, absorption spectrum, Beer's –Lambert's law and verification of the law.	Up to K-3
CLO-4	Analyse various chromatographic techniques by its working principle and applications	Up to K-4
CLO-5	Categorize the various electrophoretic techniques and radioactivity measurements	Up to K-4

Mapping of Course outcomes with Program specific Outcomes:

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	3	3	3	1	3	--
CLO-2	3	1	2	1	1	3	--
CLO-3	3	3	1	3	1	3	--
CLO-4	3	3	2	2	2	3	--
CLO-5	3	3	2	3	3	3	--

Advance application-3; Intermediate level-2; Basic level-1

Mapping of Course learning outcomes with Program Outcomes:

CO/PSO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	2	3
CLO-2	3	2	--	2	3
CLO-3	3	3	1	--	--
CLO-4	3	3	2	--	--
CLO-5	3	3	2	--	--

Advance application-3; Intermediate level-2; Basic level-1

LESSON PLAN – BIOINSTRUMENTATION

Unit	Description	Staff Name	Hours	Mode
UNIT - I	Microscopy: Introduction – magnification, resolving power and numerical aperture and types - bright field, dark field.		3	Chalk and talk Demonstration
	Phase contrast, Fluorescence, Polarising microscopy.		3	Chalk and talk PPT
	Electron microscopy- SEM and TEM.		3	Chalk and talk
UNIT - II	pH meter: Principle , working and applications		2	Chalk and talk Demonstration
	Centrifuge: Basic principles of Sedimentation- types of centrifuges and types of rotors. Mechanism of diffusion and sedimentation.		7	Chalk and talk Demonstration
UNIT - III	Colorimetry: Beer - Lambert's Law – principle and applications.		3	Chalk and talk Demonstration
	Spectrophotometry: UV-Visible, Fluorescence and Infrared spectroscopy –principle, instrumentation and applications.		6	Chalk and talk PPT
Unit-IV	Chromatography: Paper Chromatography; Thin layer Chromatography- principle, instrumentation and applications.		3	Chalk and talk Demonstration
	Gas chromatography, ion exchange, High pressure Liquid Chromatography- principle, instrumentation and applications.		3	Chalk and talk PPT
	High pressure Liquid Chromatography- principle, instrumentation and applications		3	Chalk and talk
UNIT - V	Electrophoresis: Types-moving boundary and zone electrophoresis. Techniques and applications of Agarose gel electrophoresis, native PAGE, SDS-PAGE- principle, instrumentation and applications.		5	Chalk and talk Demonstration
	Radio isotope techniques: The nature of radioactivity- natural radiation – Detection and measurement of radioactivity, GM counter. Autoradiography Applications of radioisotopes in Biological sciences. Hazards and containment of radioactivity		4	Chalk and talk
			45	

Blue Print – Bioinstrumentation Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 4	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	**19**	15.83	**42%**
K2	5	6	10	10	**31**	25.83	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K2 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-IV (K4 Level)	1Question from Unit-III (K3 Level)
		2 Questions from Unit-V (K3 Level)	1Question from Unit-V (K4 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Course content designed by Ms. R. Suguna

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. BioTechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I&II	Major Practicals	20U2LMP1	Lab in Genetics, Physiology, Biotechnology & Bioinstrumentation	3	3	40	60	100

Course Objectives:
1. To introduce students to various analytical experiments.
2. To understand and analyse the Mendelian Inheritance pattern.
3. To identify problem, Interpret results of bio-analytical techniques.

Lab Experiments
1. Simple Mendelian characters in human.
2. Monohybrid and dihybrid cross using beads – model.
3. Identification of Blood groups by kit method.
4. Observation of mitotic cell stages using onion roots.
5. Preparation of blood smear and differential staining of blood cells.
6. Estimation of Oxygen consumed by fishes by Winkler's method.
7. Identification of nitrogenous waste from excreta.
8. Plasmolysis experiments using onion cells .
9. Verification of Beer's Law.
10. Amino-acid separation using paper and thin layer chromatography.
11. Agarose Gel Electrophoresis – demonstration.
12. SDS-PAGE – demonstration.

Spotters
Polytene Chromosomes, lampbrush Chromosomes, Vector map of pBR322 and pUC18, pH meter, TLC, Pedigree Charts.

Books for Study
1. Rajan&Selvi Christy. 2010. Experimental Procedures in Lifesciences. Anjanaa Book House.
2. Kanika Sharma. 2011. Manual of Microbiology: Tools & Techniques. Ane books Pvt. Ltd
3. Sinha et al., 2011. Advanced Practical Zoology. Books & Allied (P) Ltd.

Books for Reference
1. Abhijit Dutta. 2011. Experimental Biology: A laboratory Manual. Narosa.
2. John Vennison. 2009. Laboratory Manual of Genetic Engineering. PHI.

Pedagogy
The teaching methods may include: Demonstrations, hands on experiments and Problem solving

Course Learning Outcomes:

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Show hands-on techniques that will supplement and enrich the lecture part	Up to K-2
CLO-2	Correlate the results and develop critical thinking skills	Up to K-4
CLO-3	Examine genetic inheritance pattern in both animals & Plants	Up to K-3
CLO-4	Infer the physiological process in plants and animals	Up to K-3
CLO-5	Categorize various genetic disorders	Up to K-2

Mapping of Course outcomes with Program specific Outcomes:

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	3	3	3	2	--	--
CLO-2	3	1	2	1	1	2	--
CLO-3	3	3	1	3	1	1	1
CLO-4	3	3	2	2	2	2	1
CLO-5	3	3	2	3	3	3	3

Advance application-3; Intermediate level-2; Basic level-1

Course content designed by Ms. R. Suguna & Dr. P. Vimal

DEPARTMENT OF BIOTECHNOLOGY				Certificate Course				
Course Type	Course Code	Course Code Course Title	Credits	Total Contact Hours	CIA	Ext	Total
Certificate Course		Clinical Laboratory Technology	2	30			

Course Objectives:
1. To introduce the students to learn about the various clinical practices.
2. To understand the physiological and biochemical process of various human diseases.
3. To analyse the experimental procedures of diseased and normal samples.
4. To interpret the results .prepare the clinical reports.
5. To make the students aware of the ethics and good lab practices.

Unit-I: Collection and safe handling of biological samples   **4h**

Blood, urine, stool, throat swab, sputum, pleural and cerebrospinal fluids. Transport and storage - chemical coated containers, freezing conditions. Biosafety - protective lab coat, gloves, disinfectants, disposal of biological wastes - decontamination, incineration.

Unit-II:Haematology   **4h**

Blood, serum and plasma – coagulation. Blood collection - methods. Analysis of Blood – WBC (Total and Differential count), RBC, platelets and plasma (Haemoglobin test). Blood Banking: ABO and Rh Typing – Slide test. Blood transfusion – Compatibility testing. Blood culture and sensitivity. Laboratory investigation of bleeding disorders: Determination of bleeding time, whole blood clotting time and coagulation test.

Unit-III:Biochemical analysis   **4h**

Blood glucose - Glucose Tolerance Test (GTT), Lipid profile-Total serum cholesterol, High Density Lipoprotein (HDL), Low density lipoprotein (LDL), C - reactive protein, Thyroid Function Test (TFT) - Thyroxine (T4), Triiodothyronine (T3). Cerebrospinal Fluid - appearance - chemistry.

Unit-IV: Diagnostics microbiology and immunology   **4h**

Culture of micro-organisms from biological samples – *Mycobacterium tuberculosis*, *Klebsiella pneumoniae*. Microscopic examinations and identification of pathogenic micro-organisms – wet mount, hanging drop, staining, antibiotic sensitivity, colony counting. Serological tests - Widal test, VDRL, Rheumatoid factor, A.S.O. titre

Unit-V:Stool & Urine examination   **4h**

Color - microscopic examination, Semen analysis - physical properties-Microscopic examination – motility, count. Urine examination - physical and chemical properties of urine – microscopic of urine deposits – cast crystals, cells.

Practicals 10h
1. Collection of blood sample, separation of serum and plasma
2. Total and Differential count
3. Erythrocyte Sedimentation Rate (ESR)
4. Estimation of blood glucose
5. Oral glucose tolerance test
6. Estimation of serum cholesterol
7. Isolation of microbes from throat (using swab)
8. Enumeration of bacteria using colony counter
9. Physical and chemical analysis of urine
10. WIDAL test

Books for Study
1. Sood, R, 1999, Medical Laboratory Technology – methods and interpretations, Fifth edition, Jaypee, New Delhi.
2. Mukherjee, L.K. 1988, Medical Laboratory Technology, Hill Publishing Ltd., New Delhi.
3. Connie R. Mahon. Diane G. Tice. 2006. Clinical Laboratory Immunology. 8th edition. Pearson Prentice Hall. 325 pp.

Pedagogy
The teaching methods may include:
1. Problem solving, Demonstrations, hands on experiments and Problem solving

Course Learning Outcomes:
On the successful completion of the course, students will be able to

CLO-1	Analyse different parameters involved in normal health & diseased Condition
CLO-2	Correlate different methods of analyzing body fluids
CLO-3	Describe the various biochemical test
CLO-4	Interpert the normal with the diseased sample analysis.
CLO-5	Apply the theoretical studies with experimental analysis.

Mapping of Course outcomes with Program specific Outcomes:

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	3	3	3	3	3	3
CLO-2	3	1	2	1	3	3	2
CLO-3	3	3	1	3	3	2	2
CLO-4	3	3	2	2	3	3	3
CLO-5	3	3	2	3	3	2	2

Advance application-3; Intermediate level-2; Basic level-1

Course content designed by Dr. S. Baskaran

CLASS: I B.A. / B.Sc./B.Com.								
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Common to all		Value Education and Professional Ethics	3	3	25	75	100

CLOs	K- Level	Course Learning Outcomes: The students will be able to
CLO 1	Up to K 2	Describe the various value system and its familiarity
CLO 2	Up to K 2	List forty virtues and eighty values
CLO 3	Up to K 4	Outline the foundations on value oriented moral values
CLO 4	Up to K4	Focus on relevance of various religion values and its similarities
CLO 5	Up to K 3	Build a value system and ethics in Education, Business and Teaching

Unit - I: Value System: Perceptions and Perspectives
Truth, Good and Beauty – Objectivity and Reality of Values – Scriptural Value System and Operational Value System – Various Definitions of Values – Types of Values – Intrinsic and Instrumental Aspects – Positive and Negative Values – Higher and Lower Values.

Unit - II: Listing and Classification of Values
Forty Virtues, Eighty-three Values – Classification of Values – Traditional and Functional Values – Idealized and Behavioural Values – Moral Values – Professional Values.

Unit - III: Value Oriented Moral Lessons
At Our Home – While at College – While at Party – Food Habits – Good Manner – Faith – Concentration and Prayer.

Unit – IV: Values and Religion
Karmayoga in Hinduism – Love and Justice in Christianity – Brotherhood in Islam – Compassion in Buddhism – Ahimsa in Jainism and Couragew in Sikhism – Need for Religious Harmony.

Unit – V: Professional Ethics
Codes of Ethics – Building a Value Systems – Need to go beyond Ethics – Characteristics of Ancient Indian Education System – Business Ethics – Teaching Ethics.

Books for Study
Swami Vivekananda (2001), *Universal Ethics and Moral Conduct,* Adhyaksha Advaita Ashrama, Mayavan Uttarkhand.
Subrahmanyam (2010), *Value Education,* Vivekananda Kendra Prakashan Trust, Chennai.
Vedanta Kesari (2000), *Values: The Key to a Meaningful Life,* Sri Ramakrishna Math, Chennai.
Chakraborthy, S. K. and Debangshu Chakraborthy (2014), *Human Values and Ethics: In Search of Organisational Integrity,* Himalaya Publishing House, Mumbai.

Nikhil Kulshrestha, Sandeep Sharma and Shweta Dutt Sharma (2010), *Values and Ethics*, Vayu Education of India, New Delhi.

Gupta, N. L. (2002), *Human Values in Education,* Concept Publishing Company, New Delhi.

Swami Raghuvananda, *Value Oriented Moral Lessons*, Sri Ramakrishna Math, Chennai.

Neeru Vasishth and Namith Rajput, *Business Ethics and Values,* Taxmann Publishing (P) Ltd., New Delhi.

Pedagogy: Chalk & Talk, Web based Assignments, Group Exercises, PPTs, Caselets & Case studies

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

Courses Outcomes (CLOs)	Programme Outcomes (with Graduate Attributes)					
	PO 1 (Knowledge Base)	PO 2 (Problem Analysis & Investigation)	PO 3 (Communication Skills & Design)	PO 4 (Individual and Team Work)	PO 5 Professionalism Ethics and equity)	PO 6 (Life Long Learning)
CLO 1	3	-	2	2	3	3
CLO 2	3	-	2	2	3	3
CLO 3	3	-	2	2	3	3
CLO 4	2	-	2	2	3	3
CLO 5	3	2	2	2	3	3

3- Advanced Application   2- Intermediate Development   1 - Introductory

LESSON PLAN (Total hours: 45)

Unit	Description	Staff Name	Hours	Mode
I	Truth, Good and Beauty – Objectivity and Reality of Values – Scriptural Value System and Operational Value System		3	Chalk & Talk, Web based Assignments, Group Exercises, PPTs, Caselets & Case studies
	Various Definitions of Values – Types of Values – Intrinsic and Instrumental Aspects		3	
	Positive and Negative Values – Higher and Lower Values.		3	
II	Forty Virtues, Eighty-three Values		2	
	Classification of Values – Traditional and Functional Values		3	
	Idealized and Behavioural Values – Moral Values – Professional Values.		4	
III	Value Oriented Moral Lessons at Our Home– While at College – While at Party		3	
	Food Habits – Good Manner		3	
	Faith – Concentration and Prayer.		3	
IV	Karmayoga in Hinduism – Love and Justice in Christianity – Brotherhood in Islam		4	
	Compassion in Buddhism – Ahimsa in Jainism and Couragew in Sikhism		3	
	Need for Religious Harmony.		2	
V	Professional Ethics: Codes of Ethics – Building a Value Systems		3	
	Need to go beyond Ethics – Characteristics of Ancient Indian Education System		3	
	Business Ethics – Teaching Ethics.		3	

Name of the Course Designer: Dr. C. S. Theenadayalan, Head & Associate Professor,
Department of Economics & Centre for Research in Economics

EVALUATION (THEORY)

Internal (Formative) : 25 marks
External (Summative) : 75 marks
Total :100 marks

*Summative valuation will be single and done by the internal examiner only

Continuous Internal Assessment : 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

BLUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1 & 2	Up toK2	2	K1& K2	1	K1	2 (K2&K2)	2(K2&K2)	
2	CLO 3	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 4	Up to K4	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K4)	
2	CLO 5	Up to K3	2	K1& K2	2	K2	2 (K3&K3)	1(K3)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-	-	10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions (10 X 1mark)	10
B- Short answer type (5 X 2 mark)	10
C- Either/Or type (5X 5 marks)	25
D- Open Choice type (3out of 5 X10 marks)	30
Total	75

BLUE PRINT

Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 2	2	K1& K2	1	K1	2 (K2&K2)	1(K2)
3	CLO 3	Up to K 4	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	**19**	15.83	**50%**
K2	5	6	10	20	**41**	34.17	
K3	-	-	20	20	**40**	33.33	**33%**
K4	-	-	10	10	**20**	16.67	**17%**
Total Marks	10	10	50	50	**120**	100.00	**100%**

In respect of external examinations passing minimum is 35% for Under Graduate Courses and in total, aggregate of 40%.

CLASS: I B.A. / B.Sc./B.Com.								
Semester	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Common to all		Environmental Science & Gender studies	3	3	25	75	100

Aim

      To enlighten students of all programs about the principles and practices involved in their immediate environment.

Objectives
1. To create awareness o the structure and functions of different ecosystems
2. To acquire knowledge and skills to mitigate different pollution types.
3. To sensitize students regarding genders and their strength and limitations.

Unit: 1

Fundamentals: Introduction; definition; Scope. Ecosystem – Components - Biotic and abiotic; Types of Ecosystems.

Unit: 2

Energy flow - Food web and Food chain; Interactions – Mutualism, Commensalism, Parasitism, Predation and Allelopathy.

Unit: 3

Biodiversity – Importance and threats; Hotspots; Mega diversity centers; Conservation: In-Situ and Ex-Situ methods

Unit 4

Pollution: Pollutants; Causes and types – air, noise and water. Remedial measures.

Unit: 5

Gender - Types, basis, influence of genes, hormones and environment. Stages of development – Physical, physiological and mental.

Reference:

Agarwal, K.C, 2001Environmental Biology, Nidi Publ.ltd., Bikamer

Arumugam, N., & V. Kumeresan, 2005, Saras Publications.

Bharucha Erach, The Biodiversity of India, Mapia Publishing Pvt. Ltd., Ahmedabad – 380013, India.

Connel, R.W., Ashden, D., Kessler, S., Dowsett, G (1982), Making the appearance: Schools, families and Social divisions. Sydney: Allen and Unwin.

Hawkins.R.E.,m Encyclopedia of Indian National History, Bombay Natural History Society, Bomabay.

Holmes, M., 2007 What is gender? Sociological approaches, New Delhi. Sage Publications.

Course Learning Outcomes:

	CLO Statement	Knowledge level
CLO-1	Able to list out various ecosystems and their interactions	K1 & K2
CLO-2	To appreciate the nuances behind food webs and food chains	K1 & K2
CLO-3	Able to differentiate the importance of Hotspots and mega diversity centres.	K3
CLO-4	Able to identify different types of pollutions and provide solutions	K4
CLO-5	To analyze and identify the behavioral problems among student community with reference to gender.	K3

Mapping with Programme outcomes

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	-	-	2	1	3
CO-2	2	-	2	2	1	3
CO-3	2	3	-	2	1	3
CO-4	2	-	-	2	3	3
CO-5	2	3	-	2	3	3

3- Advance application; 2- Intermediate level; 1- Basic level

LESSON PLAN (Total hours: 45)

Unit	Description	Staff Name	Hours	Mode
I	Fundamentals: Introduction, definition, Scope.		3	Chalk and Talk, PPT, Interaction, Group Discussion
	Ecosystem – Components, Biotic and abiotic;		3	
	Types of Ecosystems.		3	
II	Energy flow		2	PPT Lecture, Group Discussion, Interaction, Chalk and Talk
	Food web and Food chain		3	
	Interactions – Mutualism, Commensalism, Parasitism, Predation and Allelopathy.		4	
III	Biodiversity-Introduction		1	Group Discussion, Interaction, Chalk and Talk, PPT lecture
	Importance and threats to Biodiversity		2	
	Hotspots; Mega diversity centers		2	
	Conservation: In-Situ and Ex-Situ methods		4	
IV	Pollution: Pollutants - Introduction		1	Group Discussion Interaction PPT Lecture Chalk and Talk
	Air pollution - causes and remedial measures		3	
	Noise pollution - causes and remedial measures		2	
	Water pollution - causes and remedial measures		3	
V	Gender - Types, basis,		2	Group Discussion, Interaction, Chalk and Talk
	Gender - influence of genes, hormones and environment.		4	
	Stages of development – physical, Physiological and mental.		3	

Course designers: Prof. S. Chellapandian, Head & Associate Professor of Botany
Dr. S. Dinakaran, Head & Associate Professor of Zoology

EVALUATION (THEORY)

Internal (Formative)	: 25 marks	
External (Summative)	: 75 marks	
Total	:100 marks	

*Summative valuation will be single and done by the internal examiner only

Continuous Internal Assessment   : 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

BLUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl. No	CLOs	K-Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1 & 2	Up toK2	2	K1& K2	1	K1	2 (K2&K2)	2(K2&K2)	
2	CLO 3	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)	Total
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 4	Up to K4	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K4)	
2	CLO 5	Up to K3	2	K1& K2	2	K2	2 (K3&K3)	1(K3)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems
K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	**4**	6.67	**50**
K2	2	4	10	10	**26**	43.33	
K3	-	-	10	10	**20**	33.33	**33**
K4	-	-	-	10	**10**	16.67	**17**
Total Marks	4	6	20	30	**60**	100.00	**100%**

Question Paper Pattern for External Examination: 75 Marks

Section		Marks
A- Multiple Choice Questions	(10 X 1mark)	10
B- Short answer type	(5 X 2 mark)	10
C- Either/Or type	(5X 5 marks)	25
D- Open Choice type	(3out of 5 X10 marks)	30
Total		**75**

BLUE PRINT

Articulation Mapping - K Levels with *Course Learning Outcomes (CLOs)*

Sl.No	CLOs	K- Level	Section A MCQs		Section B Short Answers		Section C (Either/or Choice)	Section D (Open Choice)
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 2	2	K1& K2	1	K1	2 (K2&K2)	1(K2)
3	CLO 3	Up to K 4	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

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K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

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