ST. JOSEPH'S COLLEGE (AUTONOMOUS)

IRINJALAKUDA

CURRICULA AND SYLLABI FOR

BACHELOR OF VOCATION

APPLIED MICROBIOLOGY & FORENSIC SCIENCE

Under Credit Based Semester System

2020 Admissions

1. Programme Objectives

The B. Voc courses are designed with the following objectives,

a) To provide judicious mix of skills relating to a profession and appropriate content of General Education.

b) To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.

c) To provide flexibility to the students by means of pre-defined entry and multiple exit points.

d) To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.

e) To provide vertical mobility to students coming out of 10+2 with vocational subjects

PROGRAMME OUTCOMES

At the end of a UG programme, a student would have :

1. acquired adequate knowledge of the subject
2. crafted a foundation for higher learning
3. been initiated into the basics of research
4. imbibed sound moral and ethical values
5. become conscious of environmental and societal responsibilities
6. attained skills for communication and career
7. learned to tolerate diverse ideas and different points of view
8. become empowered to face the challenges of the changing universe

PROGRAMME SPECIFIC OUTCOME

	Program Specific Outcomes
PSO1	**U**nderstand the basic concepts and applications of Microbiology in various sectors viz, General , Agricultural, Industrial, Medical, Food and Dairy fields
PSO2	Understands the basic concepts of Forensic Science, Indian Judiciary system, and crime investigation techniques
PSO3	Perform practical experiments in the area of Microbiology and Forensic Science in an interdisciplinary manner
PSO4	Develop productive and socially relevant solutions to forensic and microbiological problems of the society through research oriented student academic projects

2. General Programme Structure

The B. Voc Programme is designed to bridge the potential skill gap identified. The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components.

GENERAL EDUCATION COMPONENTS

a The general education component provides emphasis to Communication skill, Presentation skill, Health and Safety and other relevant subjects in the field.

b An option for additional language should be provided which enhances the employability outside the state.

c General Education Components should not exceed 40% of the curriculum

d All B.Voc Programme should follow the General education component pattern listed below (Common English Courses and Additional language courses of LRP programmes of CUCBCSSUG 2014)

No	Semester	Course No	Course Code	Paper
1	1	1.1	GEC1EG01	Transactions Essential English Language Skills
2	1	1.2	GEC1ML02 GEC1AR02	MAL1A01(2) Malayalam- Bhashayum Sahithyavum-I ARB1A07(1) Arabic- Communication Skills in Arabic
3	2	2.1	GEC2EG04	Ways with WordsA02
4	2	2.2	GEC2ML05 GEC2AR05	MAL2A02(2)- Malayalam- Bhashayum Sahithyavum-II ARB2A08(1)-Literature In Arabic
5	3	3.1	GEC3EG07	Writing for academic & professional success A03
6	4	4.1	GEC4EG10	Zeitgeist : Readings on society and cultures A04

Skill Development Components:

a) This component should match the skill gap identified.

b) At least 50% of Skill Development Component should be allotted to practical and can grow up to 60% based on the nature of the course. The practical component can be carried out in the college and/or the industry partner

premises.

3. Levels of Awards

B. Voc is programme with multiple exits. Following table shows the various certificates and their duration.

. Awards	Duration
Diploma	2 Semester
Advance Diploma	4 Semester
B. Voc Degree	6 Semester

1. Students are free to exit at any point in the duration of the programme.
2. Only those students who successfully complete the courses and clear the examination are eligible for the certificate.
3. Separate certificate will be awarded for each year for successful candidates.
4. Students who fail in any course may be allowed to move the higher level but won't be eligible for any certificates until he/she clears previous courses.
5. B. Voc degree will confer to those whose successfully complete the diploma, higher diploma and internship.

5. Conditions for Admissions

ELIGIBILITY

- The admission to B Voc programme will be as per the rules and regulations of the University for UG admissions.
    - Basic eligibility for B.Voc is 10+2 and above in any stream (No age limit)
- The eligibility criteria for admission shall be as announced by the University from time to time.

- Separate rank lists shall be drawn up for reserved seats as per the existing rules.
- Grace Marks may be awarded to a student for meritorious achievements in co-curricular activities such as Sports/Arts/ NSS/NCC/ Student Entrepreneurship.
- Preferred subjects and index mark calculations will be decided by the respective Board of Studies.

DIPLOMA HOLDERS

Diploma holders (after 10+2) in the parent courses, approved by the University, who satisfies eligibility criteria can be admitted to the higher diploma(3 rd semester) based on the availability of the seats and is under the sole discretion of the principal of the college/ B. Voc consortium.

RESERVATION/QUOTA

A maximum of 50 students can be admitted to one B. Voc programme. The students can be admitted only to the first semester (except for diploma holders). No students are admitted directly to the Third and Fifth semester in any circumstance except for diploma holders. Diploma holders may be permitted to third semester directly as mentioned above.

The reservation rules for Government/Aided Colleges are as same as that of the regular UG programmes conducted in colleges affiliated to this university.

FEES STRUCTURE

1. The course fee and examination fee for the first three years will be decided by the University. The details of the fee structure for various courses are attached in the annexure 2.

2. The college can collect Caution deposit, PTA fund, special fees, university fees, sports fee etc according to the norms provided by the university at the time of admission.

3. After third year, with the consent of university/UGC, the college can conduct the same programme in self-financing mode (provided UGC not granting further funds). The course fee and examination fee (Regular/improvement/supplementary) structure in self financing mode will be decided by the University.

6. REGISTRATION/RE-REGISTRATION

Every candidate should register for all subjects of the Semester-End examinations of each semester. A candidate who does not register will not be permitted to attend the Semester-End examinations; he/she shall not be permitted to attend the next semester. A candidate shall be eligible to register for any higher semester, if he/she has satisfactorily completed the course

of study and registered for the examination. He/she should register for the semester at the start of the semester before the stipulated date. University will notify the starting and closing dates for each semester.

RE-JOINING THE PROGRAMME

1. Rejoining the course will be allowed to only if the candidate has secured a minimum CGPA of 2.5.
2. The candidate should remit the fees prevailing that time.
3. B. Voc governing council will take the decision regarding the rejoining.

7. Course Calendar

The B. Voc programme conducted by the affiliated institutions follows a separate calendar from the conversional degree/ PG programme. The programme is distributed over six semesters and each semester constitute 90 working days inclusive of examination.

Note: Within a week after the commencement of classes of each semester, Head of each Institution should forward the list of students, details of faculty members allotted from the college and from industry partners along with their qualification and year of experience, to the University. Also, Head of each Institution shall ensure the availability of sufficient number of faculty members having experience and qualifications in the institution.

8. ASSESSMENT OF STUDENTS

Assessment of students for each subject will be done by internal continuous assessment and Semester-End examinations. This dual mode assessment will be applicable to both Theory and Practical courses except for internship and project. Total marks in theory course reflect 80 marks external and 20 marks internal assessments. The mark division for practical courses are 20 marks internal and 80 marks external. For internship and project, there is no internal assessment. (Except for Broadcasting and Journalism, annexure attached).

	Courses	Internal	External
1	Theory	20	80
2.	Practical	20	80
3.	Internship/Project	0	100

INTERNAL

Internal assessment shall be conducted throughout the semester. It shall be based on internal examinations, assignments (such as homework, problem solving, group discussions, quiz, literature

survey, seminar, team project, software exercises, etc.) as decided by the faculty handling the course, and regularity in the class. Assignments of every semester shall preferably be submitted in Assignment Book, which is a bound book similar to laboratory record.The mark distribution to award internal continuous assessment marks for theory subject should be as follows:

Assessment	Mark
Test papers (minimum two, best two out of three is preferred)	10
Assignments (minimum two) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.	5
Regularity in the class	5

The mark distribution to award internal continuous assessment marks for practical subject should be as follows:

Assessment Type	Mark
Evaluation in the lab and Rough Record	10
End-semester Test	4
Viva	1
Regularity	5

Note:

1. No candidate will be permitted to attend the end-semester practical examination unless he/she produces certified record of the laboratory.

2. Full credit for regularity in the class can be given only if the candidate has secured minimum 90% attendance in the subject. Attendance evaluation for each course is as follows

Attendance	Marks
90% and Above	5
85 to 89.9%	4
80 to 84.9%	3
76 to 79.9%	2
75 to75.9 %	1

External

- Semester-End examinations for theory and practical courses will be conducted by the University. There shall be University examinations at the end of each semester for both theory and practical. Failed or improvement candidates will have to appear for the Semester-End examinations along with regular students.

- At the starting of each semester, Colleges should prepare question bank (containing maximum questions from each module of various types mentioned in section 13 pattern of question paper) for the external theory/practical examinations for all courses during that semester and will be sent to the university. University will prepare the question papers and answer keys for each course and will sent back to the college for conducting the examination.

- University will appoint a Chairman for each B.Voc Programme. Chairman will monitor the University Practical Examinations and Evaluation of Theory and Practical papers.

- For the evaluation of theory papers, Chairman should form a team consisting of a chief and required additional Examiners for each course.

- At the starting of each semester, Colleges should prepare a panel of External examiners for conducting Practical examinations. Chairman/University will appoint examiners from the panel proposed by colleges.

- Practical Examinations can be conducted and evaluated from the college or the industry partner premises. The team for conducting and evaluating practical exams should include an examiner appointed from the approved panel of faculties, and an internal examiner.

- Head of Institution/ Chief of Examination of the college should take necessary steps to prevent any malpractices in the Semester-End examinations. If any such instances are detected, they should be reported to the University without any delay.

- University will be issuing mark list, provisional/original certificates to the candidates.

INTERNSHIP AND PROJECT

Internship and the major project should be carried out in the industry, not necessarily with industry partner. The major idea for internship is to implement the things learned and to get a real life experience. The Evaluation process follows 100% external assessment (Except for Broadcasting and Journalism).

1. There will be internship/project at the end of 2nd and 4th semesters and an internship for the whole sixth semester.

2. Every student will be assigned an internal guide, allotted from the parent department concerned or an expert available in the college appointed by the principal or the head of the department.

3. The student has to make regular discussions with the guide while choosing the subject/area and throughout the life time of the project.

4. At least three reviews should be conducted to evaluate the progress of work.

5. An evaluation team is constituted for conducting the evaluation. The team consist of external examiner, allotted by the university from the approved examination panel, representative from the industry and a faculty.

6. Students should submit a report of their work. A valid certificate from the organization should be produced as a proof that the work is carried out in the respective organization.

7. Students are required to demonstrate the working model of their work (if possible) to the panel of examiners. A viva will be conducted based on the report and students are supposed to clarify the queries regarding their work.

8. Mark distribution for internship assessment (Except for Broadcasting & Journalism).

Distribution	**Marks**
Content and relevance of Dissertation	60
Viva	20
Presentation	10

MINIMUM FOR PASS

The successful completion of all the courses prescribed for the diploma/degree programme with E grade (40 %) shall be the minimum requirement for the award of diploma/degree.

Notes:

1. For Project/internship, the minimum for a pass shall be 50% of the total marks assigned to the respective examination.

2. A student who does not secure this pass marks in a subject will have to repeat the respective subject.

3. If a candidate has passed all examinations of B.Voc. Course (at the time of publication of results of last semester) except project/internship in the last semester, a re-examination for the same should be conducted within one month after the publication of results. Each candidate should apply for this Save-A-Year examination within one week after the publication of last semester results.

IMPROVEMENT/SUPPLEMENTARY

Candidates shall be allowed to improve the grade of any two theory courses in a semester. This can be done only in the immediate subsequent chance. If the candidate gets more than 10% mark variations in the improvement chance, marks scored in the improvement chance will be considered for grading of the course; otherwise marks scored in the first attempt will be retained. No candidate shall be permitted to improve the marks scored in practical examinations and internal continuous assessment.

9. ATTENDANCE

A candidate shall be permitted to appear for the Semester-End examinations only if he/she satisfies the following requirements:

(a) He/she must secure not less than 75% attendance in the total number of working hours in each semester.

(b) He/she must earn a progress certificate from the head of the institution stating that he/she has satisfactorily completed the course of study prescribed in the semester as required by these regulations.

(c) His/her conduct must be satisfactory

It shall be open to the Vice Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the institution in accordance with the following norms.

- The shortage shall not be more than 10%
- Shortage up to 20% shall be condoned once during the entire course provided such shortage is caused by continuous absence on genuine medical grounds.
- Shortage shall not be condoned more than twice during the entire course.

Candidate who is not eligible for condonation of shortage of attendance shall repeat the semester as per university norms.

10. PATTERN OF QUESTION PAPERS

The question papers of Semester-End examinations of theory subjects shall be able to perform achievement testing of the students in an effective manner. The question paper shall be prepared

(a) Covering all sections of the course syllabus and total marks from each module should be approximately same.

(b) Unambiguous and free from any defects/errors

(c) Emphasizing knowledge testing, problem solving & quantitative methods

(d) Containing adequate data/other information on the problems assigned (e) having clear and complete instructions to the candidates.

Duration of Semester-End examinations will be 3 hours. The pattern of questions for theory subjects shall be as follows:

Section	**Total No of Questions**	**No. of Questions to be answered**	**Marks for each question**	**Total marks**
A: Very Short/Objective answer questions	10	10	1	10
B: Short answer questions	12	8	2	16
C: Short Essays	9	6	4	24
D: Essays	4	2	15	30
Total				80

And for Practical

Marks Distribution	**Total marks**
Theory/ Algorithm/Flow diagram	20
Implementation	30
Result/Output	10
Record	10
Viva	10
Total	80

11. CREDIT SYSTEM

Each subject shall have a certain number of credits assigned to it depending upon the academic load and the nature and importance of the subject. The credit associated with each subject will be shown in the prescribed scheme and syllabi. Each course shall have an integer number of credits, which reflects its weightage.

a) One Credit would mean equivalent of 15 periods of 60 minutes each, for theory, workshops/IT and tutorials;

b) For internship/field work, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;

c) For self-learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops

12. INDIRECT GRADING SYSTEM

- Indirect Grading System based on a 7 -point scale is used to evaluate the performance of students.
- Each course is evaluated by assigning marks with a letter grade (A+, A, B, C, D, E or F) to that course by the method of indirect grading.
- An aggregate of E grade with 40 % of marks (after external and internal put together) is required in each course for a pass and also for awarding a degree/diploma.
- Appearance for Internal Assessment and End Semester Evaluation are compulsory and no grade shall be awarded to a candidate if she/he is absent for Internal Assessment / End Semester Evaluation or both.
- For a pass in each course 40% marks or E grade is necessary.
- A student who fails to secure a minimum grade for a pass in a course is permitted to write the examination along with the next batch.
- After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of a semester, a student should pass all courses. However, a student is permitted to move to the next semester irrespective of SGPA obtained.
- SGPA of the student in that semester is calculated using the formula

SGPA = Sum ofthecreditpointsofallcoursesinasemester

Total credits in that semester

- The Cumulative Grade Point Average (CGPA) of the student is calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students. CGPA can be calculated by the following

CGPA = Totalcreditpointsobtainedinsixsemesters

Total credits acquired (180)

- SGPA and CGPA shall be rounded off to two decimal places. CGPA determines the broad academic level of the student in a programme and is the index for ranking students (in terms of grade points).

- An overall letter grade (Cumulative Grade) for the entire programme shall be awarded to a student depending on her/his CGPA (See Annexure 4)

Marks scored	Grade	Remarks
90 and Above	A+	Outstanding
80 to 89	A	Excellent
70 to 79	B	Very Good
60 to 69	C	Good
50 to 59	D	Satisfactory
40 to 49	E	Adequate
Below 40	F	Failure

13. GRADE CARDS

The University shall issue to the students grade/marks card (by online) on completion of each semester, which shall contain the following information:

- Name of University
- Title of B.Voc Programme
- Semester concerned
- Name and Register Number of student
- Code number, Title and Credits of each course opted in the semester
- Internal marks, External marks, total marks, Grade point (G) and Letter grade in each course in the semester
- The total credits, total credit points and SGPA in the semester (corrected to two decimal places)
- Percentage of total marks

The final Grade/mark Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme including those taken over and above the prescribed minimum credits for obtaining the degree. However, as already mentioned, for the computation of CGPA only the best performed courses with maximum grade points alone shall be taken subject to the minimum credits requirements (180) for passing a specific degree. The final grade card shall show the percentage of marks, CGPA (corrected to two decimal places) and the overall letter grade of a student for the entire programme. The final grade/mark card shall also include the grade points and letter grade of general course and skill developmental courses separately. This is to be done in a seven point indirect scale.

14. MONITORING CELLS/COMMITTEES

EXAMINATION MONITORING CELL

Head of the each institution should formulate an Examination Monitoring Cell at the institution for conducting and supervising all examinations including the internal examinations. The structure and their collective responsibilities will be as per the university norms.

GRIEVANCE CELL

Each college should setup a Grievance Cell with at least four faculty members to look into grievances of the students, if any.

ANTI-RAGGING CELL

Head of Institution shall take necessary steps to constitute anti-ragging committee and squad at the commencement of each academic year. The committee and the squad shall take effective steps as specified by the Honorable Supreme Court of India, to prevent ragging.

CLASS COMMITTEE

Head of institution shall take necessary steps to form a class committee for each class at the start of classes of each semester. This class committee shall be in existence for the semester concerned. The class committee shall consist of the Head of Department, Staff Advisor of the class, a senior faculty member of the department, a faculty member from another department, and three student representatives (one of them should be a girl).

There should be at least two meetings of the class committee every semester; it shall be the responsibility of the Head of Department to convene these meetings. The decisions of the Class Committee shall be recorded in a register for further reference. Each class committee will communicate its recommendations to the Head of Institution.

The responsibilities of the class committee are:

a) To review periodically the progress and conduct of students in the class.

b) To discuss any problems concerning any courses in the semester concerned. c) To identify

weaker students of the class and suggest remedial measures.

d) To review teaching effectiveness and coverage of syllabus.

e) Discuss any other issue related to the students of the class.

15. COLLEGE TRANSFER

College transfer is not allowed in any circumstances.

B.Voc degree is equal to any degree approved by University of Calicut

16. TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice-Chancellor has the power to provide by order that these regulations shall be applied to any program with such necessary modification.

BACHELOR OF VOCATION

(APPLIED MICROBIOLOGY AND FORENSIC SCIENCE)

PROGRAMME STRUCTURE

Semester I									
C.No	Course Code	Course Name	Credit	Marks			Hours/week		
				Int	Ext	total	Th	Prac	Total
1.1	SJGEC1EG01	Transactions Essential English Language Skills A01	4	20	80	100	4		4
1.2	SJGEC1ML02 SJGEC1HD02	Common course -7 Malayalam Bhashayum Sahithyavum-I MAL1 A01 (2) Prose and one act plays A07(3)	4	20	80	100	4		4
1.3	SJGEC1CH03	Chemistry I	4	20	80	100	4		4
1.4	SJSDC1MB1	General Microbiology, Physiology & Taxonomy	5	20	80	100	5		5
1.5	SJSDC1FSC1	Fundamentals of Forensic Science & Criminal Major Acts	5	20	80	100	5		5
1.6	SJSDC1MB2(P)	Practical related to General Microbiology, Physiology	4	20	80	100		4	4
1.7	SJSDC1FSC2(P)	Practicals related to Forensic Science I (1.5)	4	20	80	100		4	4
		Semester I total	**30**			**700**	**22**	**8**	**30**
Semester II									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
2.1	SJGEC2EG04	Ways with Words A02	4	20	80	100	4		4
2.2	SJGEC2ML05 SJGEC2HD05	Common course-9 MalayalamBhashayum Sahithyavum-II MAL2A02(2) Poetry and short stories A09(3)	4	20	80	100	4		4
2.3	SJGEC2CH06	Chemistry II	4	20	80	100	4		4
2.4	SJSDC2MB3	Environmental & Industrial Microbiology	5	20	80	100	5		5

2.5	SJSDC2FSC3	Criminology, Penology, Victimology, Forensic Psychology & Instrumentation Techniques	5	20	80	100	5		5
2.6	SJSDC2MB4 (P)	Practicals on Environmental, Industrial Microbiology & Instrumentation Techniques	4	20	80	100	4		4
2.7	SJSDC2MB/FSC (Pr1)	Mini Project	4	0	100	100		4	4
		Semester II total	**30**			**700**	**26**	**4**	**30**
Semester III									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
3.1	SJGEC3EG07	Writing for academic & professional success A03	4	20	80	100	4		4
3.2	SJGEC3ZO08	Zoology I	4	20	80	100	4		4
3.3	SJGEC3CH09	Chemistry III	4	20	80	100	4		4
3.4	SJSDC3MB5	Food, Dairy & Agricultural Microbiology	5	20	80	100	5		5
3.5	SJSDC3 FSC4	Forensic Chemistry & Toxicology	5	20	80	100	5		5
3.6	SJSDC3MB6 (P)	Practical on Food, Dairy & Agricultural Microbiology (3.4)	4	20	80	100		4	4
3.7	SJSDC3FSC5 (P)	Practical on Forensic Science II (2.5, 3.5)	4	20	80	100		4	4
		Semester III Total	**30**			**700**	**22**	**8**	**30**
Semester IV									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
4.1	SJGEC4EG10	Zeitgeist : Readings on society and cultures A04	4	20	80	100	4		4
4.2	SJGEC4ZO11	Zoology II	4	20	80	100	4		4
4.3	SJGEC4 CH12	Chemistry IV	4	20	80	100	4		4

4.4	SJSDC4 FSC6	Forensic Physics, Ballistics, Dermatoglyphics & Questioned Documents	5	20	80	100	5		5
4.5	SJSDC4MB7	Medical Microbiology and Immunology	5	20	80	100	5		5
4.6	SJSDC4CH5 (P)	Practical on Chemistry (1.3,2.3.3.3,4.3)	4	20	80	100		4	4
4.7	SJSDC4MB/FSC (Pr2)	Mini Project	4	0	100	100		4	4
		Semester IV total	**30**			**700**	**22**	**8**	**30**
Semester V									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
5.1	SJGEC5MB13	Molecular biology and Bioinformatics	4	20	80	100	4		4
5.2	SJGEC5MB14	Microbial Genetics & genetic engineering	4	20	80	100	4		4
5.3	SJSDC5 FSC7	Forensic Biology, Serology& Forensic Medicine	5	20	80	100	5		5
5.4	SJSDC5FSC8	Crime Investigation Techniques & techniques in personal identification	5	20	80	100	5		5
5.5	SJSDC5FSC9	Cyber crime & cyber forensics	4	20	80	100	4		4
5.6	SJSDC5MB8 (P)	Practical on Microbiology (4.5,5.2)	4	20	80	100		4	4
5.7	SJSDC5FSC10(P)	Practical on Forensic Science III (4.4, 5.3,5.4, 5.5)	4	20	80	100		4	4
		Semester V total	**30**			**700**	**22**	**8**	**30**
Semester VI									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
6.1	SJSDC6MB/FSC (Pr)	Internship and Project (900hrs)	30	0	100	100	0	30	30
		Semester VI total	**30**			**100**			**30**
		Grand Total	**180**			**3600**			

SEMESTER I

Semester I									
C.No	Course Code	Course Name	Credit	Marks			Hours/week		
				Int	Ext	total	Th	Prac	Total
1.1	SJGEC1EG01	Transactions Essential English Language Skills A01	4	20	80	100	4		4
1.2	SJGEC1ML02 SJGEC1HD02	Common course -7 Malayalam Bhashayum Sahithyavum-I MAL1 A01 (2) Prose and one act plays A07(3)	4	20	80	100	4		4
1.3	SJGEC1CH03	Chemistry I	4	20	80	100	4		4
1.4	SJSDC1MB1	General Microbiology, Physiology & Taxonomy	5	20	80	100	5		5
1.5	SJSDC1FSC1	Fundamentals of Forensic Science & Criminal Major Acts	5	20	80	100	5		5
1.6	SJSDC1MB2(P)	Practical related to General Microbiology, Physiology	4	20	80	100		4	4
1.7	SJSDC1FSC2(P)	Practicals related to Forensic Science I (1.5)	4	20	80	100		4	4
Semester I total			**30**			**700**	**22**	**8**	**30**

SJ**GEC1EG01 :** Transactions Essential English Language Skills A01

Course No: 1.1
Course Code: SJGEC1EG01
Course Name: Transactions Essential English Language Skills A01

Credits:4

Hours:60

II COURSE DETAILS

Module-I: Pronunciation

Introduction--speech sounds-vowels-consonants-basics of word/sentence stress- resolving issues of L1 interference-e/m-learning corner.

Module-II: Vocabulary

Introduction- synonyms-collocations-phrasal verbs-idiomatic expressions-vocabulary in everyday social contexts- e/m-learning corner.

Module-III: Grammar

Introduction- major tenses-modals-questions - negatives-frequently used constructions—dealing with common mistakes- e/m-learning corner.

Module–IV: Speaking Skills

Social Communication: Introduction – sounding very polite- making a point/persuading- giving opinions/preferences-encouraging/comforting- making suggestions/regrets.-complimenting-guessing-telephoning in English.

Academic Communication: Discussion skills – presentation skills-debating skills- e/m-learning corner.

Module-V: Reading Skills

Introduction-effective reading comprehension skills-understanding generic/specific ideas /factual information-vocabulary in context- implications/tone/attitude/viewpoint.

Code	Title	Author	Publisher
ENG1 A01	TransActions: ESSENTIAL ENGLISH LANGUAGE SKILLS	Dr. Kunhammad K.K. & Dr. Abdul Latheef V	University of Calicut

SJGEC1ML/02 (Malayalam/Hindi)
SJGEC1ML02 Malayalam – MAL1A01 (3) Malayalam Bhashayum SahithyavumI

Course No: 1.2
Course Code: SJ**GEC1ML/02**
Course Name: Malayalam – Bhashayum SahithyavumI
Credits: 4
Hours: 60

LRP PROGRAMME

FIRST SEMESTER

Common Course in Hindi (Course No. 07)
Course No: 1.2
Course Code: SJGEC1HD02
Course Name:A07 – Communication skills in Hindi
Hours: 60
COMMUNICATION SKILLS IN HINDI
No. of Credits: 1
No. of contact Hours: 60
Aim of the Course:
To make the subjects well versed in Hindi so that they can speak Hindi fluently and use Hindi as a medicine of communication in the fields of Commerce, Administration etc.
Objectives of the Course:
1) Learn Hindi for effective communication in different spheres of life – education, governance, media, business of mass communication etc.

2) Investigate problems and challenges of effective communication in Hindi

3) Correspondence in Hindi as a tool of communication

4) Translation as a tool of communication

5) Conversationalisation as a communication technique. .
Course Outline
ModuleI. : Hindi as link language, national language, official language, Hindi in administration law and business, Hindi and mass communication.
ModuleII.: Correspondence in , Technical terminology.
ModuleIII. : Communicative skills in different spheres of life, interviews
ModuleIV. : Conversation as a communication technique.

Prescribed text books
1. Bolchal ki Hindi aur sanchar – Dr. Madhu Dhawan; Vani Prakashan, 21A, Dariyaganj, New Delhi.
2. Ekanki sapthak – Ed. Champa Srivasthav, lokhbharathy Prakashan, Allahabad.

For ModuleI Hindi Bhasha : Sampark bhasha, Rashtra bhasha aur Rajbhasha, Karyalayi bhasha, Vidhik cyaparik aur vanijyaik bhasha – Jansanchar ki bhasha (All

from Bolchal ki Hindi aur Sanchar)
For ModuleII : Paribhashik sabdavali – karyalayi aur Prasasanik prayukthiyam (1 to 50 wordds only)
Correspondence : Letter for Job
For ModuleIII Baatcheet – khar mein, Pryatan mein, Rail yathra mein, Bank mein, Aspathal mein, Police station mein on telephone and Sakshatkar.
For Module IV – 1) Naye mehman by Uday Sankar Bhatt 2) Sookhi daal by Upendranath Ask 3) Seema Rekha by Vishnu Prabhakar (all from Ekank Sapthak)

SJGEC1CH03	Chemistry I

Course No: 1.3
Course Code: SJGEC1CH03
Course Name: Chemistry I.
Credits: 4
Hours: 60

Aim of the Course: To equip the students with basic principles of Chemistry
Objectives of the Course:

- To understand basic facts and concepts in chemistry.
- To develop the ability for applying the principles of chemistry.

Prerequisites:
Background of the basic science at +2 level

COURSE OUTLINE

Module I: Some Basic Chemical Concepts (9 hrs)

Evolution of Chemistry- Ancient speculations on the nature of matter - Early form of Chemistry – Alchemy - Origin of modern chemistry.Modern periodic law – Long form periodic table. Periodicity in properties: Atomic radii, ionic radii,ionization enthalpy, electron affinity (electron gain enthalpy) and electronegativity (Pauling scale).

Atomic mass - Molecular mass - Mole concept – Molar volume - Oxidation and reduction – Oxidation
number and valency - Equivalent mass. Methods of expressing concentration: Molality, molarity, normality and mole fraction.Theory of acids and bases: Arrhenius theory, Bronsted-Lowry theory and Lewis theory.

Module II: Analytical Chemistry (6 hrs)

Theory of volumetric analysis – Acid base, redox and complexometric titrations – Acid-base, redox andcomplexometric indicators. Double burette method of titration: Principle and advantages. Principles in the separation of cations in qualitative analysis - Applications of common ion effect and solubility product - Microanalysis and its advantages.Accuracy & Precision (mention only).

Module III: Atomic Structure and Chemical Bonding (9 hrs)

Atomic Structure: Bohr atom model and its limitations - de Broglie equation - Heisenberg uncertainty principle - Schrödinger wave equation (mention only) - Atomic orbitals - Quantum numbers and their significance - Pauli's Exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle – Electronic configuration of atoms.

Chemical Bonding: Introduction – Type of bonds.Ionic bond: Factors favouring the formation of ionic bonds - Lattice energy of ionic compounds and itsapplication.Covalent bond: Lewis theory - Valence bond theory – Coordinate bond.VSEPR theory: Shapes of $BeCl_2$, BF_3, $SnCl_2$, CH_4, NH_3, H_2O, NH_4^+, SO_4^{2-}, PCl_5, SF_4, ClF_3, XeF_2, SF_6,IF_5, XeF_4, IF_7 and XeF_6.Hybridisation involving s, p and d orbitals: sp (acetylene), sp^2 (ethylene), sp^3 (CH_4), sp^3d (PCl_5), sp^3d^2(SF_6) and sp^3d^3 (IF_7).
Molecular orbital theory: LCAO – Electronic configuration of H_2, B_2, C_2, N_2, O_2 and CO – Calculation of bond order – Explanation of bond length and bond strength.Intermolecular forces - Hydrogen bonding in H_2O - Dipole-dipole interactions.

Module IV: Nuclear Chemistry (6 hrs)

Natural radioactivity – Modes of decay – Group displacement law.Nuclear forces - n/p ratio -Nuclear stability - Mass Defect - Binding energy.Isotopes, isobars and isotones with examples Nuclear fission - Atom bomb – Nuclear fusion – Hydrogen bomb - Nuclear reactors - Nuclear reactors inIndia.Application of radioactive isotopes – ^{14}C dating – Rock dating – Isotopes as tracers – Radio diagnosis and radiotherapy.

Module V: Bioinorganic Chemistry (6 hrs)

Metal ions in biological systems - Biochemistry of iron – Haemoglobin and myoglobin - Mechanism of O_2 and CO_2 transportation - Chlorophyll and photosynthesis (mechanism not expected) – Elementary idea of structure and mechanism of action of sodium potassium pump - Biochemistry of zinc and cobalt.

References

1. R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31 st Edition, Milestone Publishers and Distributors, New Delhi, 2013.

2. C.N.R. Rao, *Understanding Chemistry*, Universities Press India Ltd., Hyderabad, 1999.
3. J. Mendham. R.C. Denney, J.D. Barnes and M. Thomas, *Vogel's Textbook of Quantitative ChemicalAnalysis*, 6th Edition, Pearson Education, Noida, 2013.

4. G. Svehla, *Vogel's Qualitative Inorganic Analysis*, 7th Edition, Prentice Hall, New Delhi, 1996.
5. R.K. Prasad, *Quantum Chemistry*, 4th Edition, New Age International (P) Ltd., New Delhi, 2012.
6. Manas Chanda, *Atomic Structure and Chemical Bonding*, 4th Edition, Tata McGraw Hill Publishing Company, Noida, 2007.

7. H.J. Arnikar, *Essentials of Nuclear Chemistry*, 4th Edition, New Age International (P) Ltd., New Delhi, 1995 (Reprint 2005).

8. J.D. Lee, *Concise Inorganic Chemistry*, 5th Edition, Oxford University Press, New Delhi, 2008.

SJSDC1MB1	GENERAL MICROBIOLOGY, PHYSIOLOGY & TAXONOMY

Course No: 1.4
Course Code: SJSDC1MB1

Course Name: General Microbiology, Physiology & Taxonomy

Credits: 5 , Hours: 75

Objectives

On completion of this course, the student should be able to:

- Analyse and interpret basics of Microbiology
- Taxonomically identify microbes

Prerequisites

Background of the basic science at +2 level

Course Outline

5 hours / week 5 credits

	Course Outcome	POs/ PSOs	CL	K C	Class Sessions (appr.)	Lab (Hrs)
CO 1	To evaluate history of Microbiology	PO2/ PSO1	R	F	6	-
CO 2	To understand basic features of microorganisms using microscopic techniques	PO1/ PSO1	U	F	14	-
CO 3	To analyse the principles of sterilisation techniques	PO1/ PSO1	E	C	4	-
CO 4	To evaluate the ultrastructural properties of microbe	PO3/ PSO1	E	P	10	-
CO 5	To analyse the nutritional requirements of microbes	PO2/ PSO1	U,A	F	17	-
CO 6	To evaluate the growth patterns of microbes	PO1/ PSO1	E,C	C	13	-
CO 7	To evaluate the modes of reproduction of microbes	PO1/ PSO1	Z	F	6	-
CO 8	Evaluate the concepts of microbial taxonomy	PO3/ PSO1	A	C	6	-

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

***F-factual, C-conceptual, P-practical/procedural**

SECTION 1.GENERAL MICROBIOLOGY

Unit -1- 6 hrs:

History and development of Microbiology, spontaneous generation vs. biogenesis. Contributions of the following scientists in various areas of Microbiology - Anton van Leeuwenhoek, Joseph Lister, Paul Ehrlich, Edward Jenner, Louis Pasteur, Robert Koch, Martinus W. Beijerinck, Sergei N. Winogradsky, Alexander Fleming, Selman A. Waksman.

Unit-2 -4 hrs

Eukaryote and prokaryote - differences. Differentiate archaebacteria, eubacteria and Cyano bacteria. Bacterial forms and arrangement of cells – coccus, bacillus, spirals, coma, actinomycetes, kidney shaped, stalked, pleomorphic. Diplo, chain, trichome, palisade, and arrangements. Mold and yeast forms. Viral and bacteriophage forms.

Unit-3- 10 hrs

Microscopy- bright field, dark field, phase contrast, fluorescent and electron microscopy. Staining techniques- simple and differential- Grams, spore, flagella, volutin, capsule, negative and Fuelgen staining.

Unit-4 10hrs

Sterilisation techniques- Physical and chemical methods- flaming, boiling, autoclaving, inspissation, Heat, filteration, Radiation. Asceptic methods- laminar air flow hood. Phenol coefficient.

SECTION 2: MICROBIAL PHYSIOLOGY AND TAXONOMY

Unit 1 -10 hrs

Bacterial structure: **External structures-**glycocalyx, capsule, flagella, fimbriae and pili. **Cell-wall**: Composition and detailed structure of gram positive and gram-negative cell walls, Archaebacterial cell wall, sphaeroplasts, protoplasts, and L-forms. Effect of penicillin and lysozyme on the cell wall.**Cell Membrane**: Structure, function and chemical composition of bacterial and archaeal cell membranes.**Cytoplasm**: Ribosomes, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids **Endospore:** Structure, formation, stages of sporulation.

Unit 2 -10 hrs

Culture media-Solid and liquid media, use of agar. Selective, Enrichment, Enriched, differential, selective-differential, indicator media, Transport media, simple and complex, synthetic or defined, Anaerobic media. Culture methods-Streak, spread, pour plate methods, stab culture and lawn culture. Anaerobic culture methods. Culture preservation strategies.

Unit 3 -7 hrs

Growth curve and its significance, generation time, steady state culture, synchronous culture and Diauxic culture, Quantitative measurement of bacterial growth by direct and indirect methods.

Unit 4 -7 hrs

Transport of nutrients by bacteria- passive, active and group translocation. symport, antiport and uniport, electrogenic and electro neutral transport, transport of Iron. Microbial metabolism-a brief description-Energy production by anaerobic processes, aerobic processes and photosynthesis- a brief description.

Unit 5 -6 hrs

Effect of various parameters and Environmental factors on microbial growth- Temperature, pH, O2, solute concentration. Classification based on specific requirement-based on temperature, pH, O2 and solute concentration .Nutritional requirements of bacteria- C, electron, energy, and minerals. Nutritional types of bacteria- based on the requirement and their combinations. Modes of bacterial nutrition.

Unit6 -6 hrs

Modes of reproduction in bacteria- fission, budding, fragmentation, sporulation etc. Viral replication- lytic and lysogenic methods. Viral and bacteriophage Quantitation methods- Plaque and pock assay.

Unit7 -6 hrs

Basics of microbial taxonomy- concept of species and taxa and strain. Classification systems- Numerical taxonomy or Adansonian classification, phenetic and phylogenetic Classification. Various criteria used in bacterial classification :- classical, morphological , physiological, metabolic and ecological characteristics. Molecular characteristics- comparison of proteins, nucleic acid base composition, nucleic acid hybridization and nucleic acid sequencing, 16S rRNA studies. Classification systems in fungus and their different classes.

Suggested Readings.

1. Fundamentals of Bacteriology by A.J Salle
2. Microbiology by Pelczar *et al*
3. Fundamentals of Microbiology by Mertus Frobisher
4. General microbiology by Stanier *et al*
5. Text book of Microbiology by Prescott.
6. Principles of Microbiology by Ronald Atlas
7. Microbiology: An Introduction by Tortora GJ, Funke BR, and Case CL.
8. *Microbiology: Principles and Explorations* by Black.

9. *Brock Biology of Micro-organisms*.

10. Lippincotts Illustrated Reviews Microbiology by Harvey

11. Alcamos Fundamentals Of Microbiology
12. Gottschalk G. (1986). *Bacterial Metabolism*. 2nd edition. Springer Verlag Madigan MT, Martinko JM and Parker J. (2003
13. Moat AG and Foster JW. (2002). *Microbial Physiology*. 4th edition. John Wiley & Sons. 14. Reddy SR and Reddy SM. (2005). *Microbial Physiology*. Scientific Publishers India.

SJSDC1FSC1	FUNDAMENTALS OF FORENSIC SCIENCE & CRIMINAL MAJOR ACTS

Course No: 1.5
Course Code: SJSDC1FSC1
Course Name: Fundamentals of Forensic Science &Criminal Major Acts
Credits: 5, Hours:75

Objectives

After studying this paper the students will know –
a. The significance of forensic science to human society.
b. The fundamental principles and functions of forensic science.
c. The divisions in a forensic science laboratory.
d. The working of the forensic establishments in India and abroad.

Course Code: SJSDC1FSC1

Name of the Course: Fundamentals of Forensic science & Criminal Major Acts

	Course Outcome	POs/ PSOs	CL	KC	Class Sessn appr.	Lab hrs
CO1	Evaluate the fundamental principles of forensic science	PO1/PSO2	E	F	12	-
CO2	To evaluate criminal justice system	PO1/PSO2	E	F	12	-
CO3	Evaluate various forensic science institutions	PO1/PSO2	E	F	12	-
CO4	To understand Indian Constitution	PO1/PSO2	U	F	8	-
CO5	To evaluate Criminal Major Acts	PO1/PSO2	E	F	18	-
CO6	understand Criminal Minor Acts	PO1/PSO2	U	F	10	-

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

5hrs/week 5credit

SECTION 1.Fundamentals of Forensic Science

Module I: History and development of Forensic Science (12 hrs) Historical aspects of forensic science, Definitions and concepts of forensic science, Need of Forensic Science, Basic principles of Forensic Science, Functions of Forensic Science, Different branches of Forensic Science. Frye case and Daubert standard.

Module II: Legal aspects of crime (12 hrs) Crime – Introduction, Nature, causes and consequences of crime, Broad concepts of criminal Justice System, Procedures involved in the detection of crime, Filing of criminal charges, Indian police system – The police Act, Human rights and criminal justice system in India. Set up of INTERPOL.

Module III: Organizational set up of FSLs in India (12 hrs) Hierarchical set up of central forensic science laboratory, Hierarchical set up of state forensic science laboratory, Government examiners of questioned documents, Chemical examiners laboratory, Finger print bureaus, National crime records bureau, Bureau of police research and development, Mobile crime laboratory, Duties of forensic scientist, code of conduct of forensic scientists.

Recommended Reading:

1. B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).

2. M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).

3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

4. W.G. Eckert and R.K. Wright in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).

5. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).

6. W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

SECTION 2: CRIMINAL MAJOR ACTS

Module I: Indian Constitution (8 hrs) Preamble, Fundamental rights, Directive principles of state policy, Fundamental Duties, The Union Judiciary, The State, The Union Territories, Relation between the Union & the State, Tribunals, Elections, Special Provision related certain classes, Emergency provisions and Schedules.

Module II: Criminal Major Acts (18 hrs) Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts. Criminal Procedure Code. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass. Summary trials – Section 260(2). Judgements in abridged forms – Section 355. Indian Penal Code pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362. Sections 375 & 377 and their amendments. Indian Penal Code pertaining to offences against property Sections – 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497, 499, 503, 511. Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. Section 293 in the code of criminal procedure.

Module III: Criminal Minor Acts and Social Legislations (10 hrs) Narcotic Drugs and Psychotropic Substances Act, Essential Commodity Act, Drugs and Cosmetics Act, Explosive Substances Act, Arms Act, Dowry Prohibition Act, Prevention of Food Adulteration Act, Prevention of Corruption Act, Wildlife Protection Act, I.T. Act, Environment Protection Act, Untouchability Offences Act, J.J Act, POCSO Act, KAAPA, SC & ST (Prevention of Atrocities) Act.

Recommended Reading:

1. D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton (1999).

2. Vipa P. Sarthi, *Law of Evidence*, 6th Edition, Eastern Book Co., Lucknow (2006).

3. A.S. Pillia, *Criminal Law*, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).

4. R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi (1965).

5. (Chief Justice) M. Monir, *Law of Evidence*, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002)

SJSDC1MB2(P)	PRACTICAL RELATED TO GENERAL MICROBIOLOGY, PHYSIOLOGY

Course No: 1.6
Course Code: SJSDC1MB2(P)
Course Name: Practical related to General Microbiology
Credits: 4
Hours: 60
Objectives

- To study basic Microbiological techniques
- To evaluate Culturing techniques

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To evaluate different microbial staining techniques	PO3/PSO3	U,A	P	-	15
CO2	To analyse various culturing techniques of microbes	PO3/PSO3	E	P	-	15
CO3	To evaluate the microbial growth	PO3/PSO3	Z,C	P	-	15
CO4	To biochemically characterise microbes	PO3/PSO3	E	P	-	15

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

SJSDC1MB2(P)- PRACTICAL RELATED TO GENERAL MICROBIOLOGY, PHYSIOLOGY

4 hours / credits per week

1. Introduction to common methods of sterilization

2. Introduction to common laboratory instruments in Microbiology like hot air oven, autoclave, laminar air flow cabinet, incubator etc.

3. Microscope and its maintenance.

4. Simple Staining.

5. Grams staining.

6. Capsule Staining.

7. Spore Staining.

8. Flagella Staining.

9. Preparation of media (Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, McConkey agar, EMB agar).

10. Motility determination - Hanging drop method, Semisolid agar method

11. Isolation of pure culture by streaking.

1 2. Enumeration of microbial cells (pour plate and spread plate method).

13. Fungal staining & Culture

14.Effect of temperature on growth of microorganisms- TDT and TDP.

15. Influence of pH on growth.

16. Bacterial growth curve.

17.Biochemical characterization of bacterial cultures: catalase, urease, cytochrome oxidase and sugar fermentation, citrate utilization, gelatin liquefaction, sulfide indole motility test.

18.Bacterial population count by turbidity method.

19. Estimation of fungal growth by gravimetric estimation.

SJSDC1FSC2(P)	Practicals related to Forensic Science I (1.5)

Course No: 1.7
Course Code: SJSDC1FSC2(P)
Course Name: Practicals related to Forensic Science I (1.5)
Credits: 4
Hours: 60

Course Code: SJSDC1FSC2(P)

Name of the Course: Practicals Related to Forensic Science 1

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions appr.	Lab Hrs
CO1	To analyse various crime cases from Forensic Science perspectives	PO1/PSO3	Z	C	-	15
CO2	To analyse various Forensic Science establishment	PO1/PSO3	Z	P	-	15
CO3	To study cases in which Criminal Major Acts were invoked	PO1/PSO3	R	P	-	15
CO4	To analyse cases in which Criminal Minor Acts were invoked	PO1/PSO3	Z	P	-	15

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***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

SJSDC1FSC2(P)- PRACTICALS RELATED TO FORENSIC SCIENCE I (based on 1.5)

4 hrs/week 4 credits

1. To study the history of crime cases from forensic science perspective.

2. To cite examples of crime cases in which apprehensions arose because of Daubert standards.

3. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.

4. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.

5. To write report on different type of crime cases.

6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.

7. To examine the hierarchical set up of different forensic science establishments and suggest improvements.

8. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.

9. To compare and contrast the role of a Police Academy and a Police Training College.

10. To compare the code of conduct prescribed by different establishments for forensic scientists.

11. To study the powers and limitations of the Court of Judicial Magistrate of First Class.

12. To prepare a schedule of five cognizable and five non-cognizable offences.

13. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal Procedure Code.

14. To study a crime case in which an accused was punished on charge of murder under Section 302.

15. To study a crime case in which an accused was punished on charge of rape under Section 375.

16. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.

17. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in 21 this Article were taken care of.

18. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.

19. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.

20. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which they belonged.

21. To study a case in which Drugs and Cosmetic Act was invoked.

22. To study a case in which Explosive Substances Act was invoked.

23. To study a case in which Arms Act was invoked.

24. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.

25. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution of India.

SEMESTER II

Semester II									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
2.1	SJGEC2EG04	Ways with Words A02	4	20	80	100	4		4
2.2	SJGEC2ML05 SJGEC2HD05	Common course-9 MalayalamBhashayum Sahithyavum-II MAL2A02(2) Poetry and short stories A09(3)	4	20	80	100	4		4
2.3	SJGEC2CH06	Chemistry II	4	20	80	100	4		4
2.4	SJSDC2MB3	Environmental & Industrial Microbiology	5	20	80	100	5		5
2.5	SJSDC2FSC3	Criminology, Penology, Victimology, Forensic Psychology & Instrumentation Techniques	5	20	80	100	5		5
2.6	SJSDC2MB4 (P)	Practicals on Environmental, Industrial Microbiology & Instrumentation	4	20	80	100	4		4

		Techniques							
2.7	SJSDC2MB/FSC (Pr1)	Mini Project	4	0	100	100		4	4
		Semester II total	**30**			**700**	**26**	**4**	**30**

SJGEC2EG04	Ways with Words A02

Course Code: SJGEC2EG04

Course Name: Ways with Words A02
Credits: 4
Hours: 60 (4 hrs per week)

OBJECTIVE OF THE COURSE

a. To introduce learners to representative English prose from different Cultural and geographical backgrounds
b. To cultivate their tastes in drama
c. To expose to logical and imaginative writing

II. COURSE DETAILS

MODULE 1: Poetry

1. Sonnet 29 : Shakespeare
2. Ode to Autumn: John Keats
3. A Roadside Stand: Robert Frost
4. The House of My Childhood: Dilip Chitre
5. Old Folks Laugh: Maya Angelou
6. Once Upon a Time: Gabriel Okara
7. The Times They are A-Changing : Bob Dylan

MODULE 2: Short Story

1. Appointment in Samarra: W. Somerset Maugham
2. A Shocking Accident: Graham Greene
3. Lamb to the Slaughter: Roald Dahl
4. It Used to be Green Once : Patricia Grace

MODULE 3: Essay

1. Bores: E. V Lucas
2. Night Walkers and Mystery Mongers: Sense and Nonsense at the Edge of Science: Carl Sagan

MODULE 4: One Act Play

1. Something Unspoken: Tennesee Williams

Core text

Code	Title	Author	Publisher
ENG1 A02	WAYS WITH WORDS LITERATURES IN ENGLISH	BoS, University of Calicut	University of Calicut

SJ**GEC2ML/02 (Malayalam/Hindi)**

SJGEC2ML02 Malayalam – MAL2A01 (4) Malayalam Bhashayum SahithyavumII

Course No: 2.2
Course Code: SJGEC2ML03 MAL2A01 (4)
Course Name: Malayalam – Bhashayum SahithyavumII
Credits: 4
Hours: 60

SJGEC1HD05 : LRP PROGRAMME

SECOND SEMESTER

Common Course in Hindi (Course No. 09)
Course No: 2.2
Course Code: SJGEC1HD05
Course Name: A07 – Communication skills in Hindi
Hours: 60

LITERATURE IN HINDI

No. of Credits: 4
No. of contact Hours: 60

Aim of the Course:

The aim of the course s to sensitize the students in the aesthetic, cultural and social aspects of literary appreciation and analysis.

Objectives of the Course:

3. Appreciation of literature using the best specimens provided as a reading list or anthology.
4. Practicing literary analysis and literary criticism using the best specimens.
5. Understanding Literary works as cultural and communicative events –

different periods, genres and movements; Literature and Society.

Course Outline

ModuleI. : Ancient hindi Poetry – A collection of selected ancient poems.

ModuleII.: Modern Hindi poetry – Acollection of poems of different poets of different periods representing different themes and styles.

ModuleIII. : Hindi short stories A collection of short stories

Prescribed text books

1. Kavya Sargam – Ed: Santhosh Kumar Chaturvedi; Lokabharathi Prakashan Allahabad
2. Kahani Kunj – Ed: Dr. V. P. Amitabh; Govind Prakashan, Sardar Bazar, Mathura, U. P..

Reading List Required Reading.

For ModuleI 1) First five dohas of Kabir 2) First two padas of Surdas

For ModuleII : Manushyatha – Maithilisaran Gupta 2) Taj – Sumitranandan pant 3) Fazal – Sarveswar Dayal Saxena 4) Bees Sall Baad Dhoomil 5) naye ilake Mein –Arun Kamal 6) Aurathem – Uday Prakash 7) Sok Geeth – Kathyayani (all from Kavya Sargam)

For ModuleIII 1) Apna Paraya – Jainendra Kumar 2) Aadmi ka Bacha – Yashpal 3) Bholaram ka jeev Harisankar Parsai 4) Mavali – Mohan Rakesh 5) Dilli Mein Ek Mouth kamaleswar (all from Kahani Kunj)

SJGEC2CH06	CHEMISTRY II

Course No: 2.3

Course Code: SJGEC2CH06

Course Name: CHEMISTRY II

Credits: 4

Hours: 60

COURSE OUTLINE

PHYSICAL CHEMISTRY

Total Hours: 60; Credits: 4; Hours/Week: 4

Module I: Thermodynamics (9 hrs)

Definition of thermodynamic terms - System – Surroundings - Types of systems.First law of Thermodynamics - Internal energy - Significance of internal energy change – Enthalpy Second law of Thermodynamics - Entropy and spontaneity - Statement of second law based on entropy.Entropy change in phase transitions (derivation not required) - Entropy of fusion, vaporizationandsublimation.The concept of Gibbs free energy - Physical significance of free energy - Conditions for equilibrium andspontaneity based on ΔG values - Effect of temperature on spontaneity of reactionThird law of Thermodynamics.

Module II: Gaseous and Solid States (9 hrs)

Gaseous State: Introduction - Kinetic molecular model of gases – Maxwell distribution of velocities andits use in calculating molecular velocities – Average velocity, RMS velocity and most probable velocity(derivations not required) – Boyle's law – Charles's law – Ideal gas equation – Behaviour of real gases –Deviation from ideal behavior - Van der Waals equation (derivation not required). *Solid State:* Introduction - Isotropy and anisotropy - Symmetry elements in crystals - The seven crystalsystems – Miller indices - Bravais lattices – Bragg's equation (derivation required) and its applications(mention only). Defects in crystals: Non-stoichiometric and stoichiometric defects - Extrinsic andintrinsic defects.Liquid crystals: Types, examples and applications.

Module III: Liquid State and Solutions (6 hrs)

Liquid State: Introduction - Vapour pressure, surface tension and viscosity – Explanation of these properties on the basis of intermolecular attraction.

Solutions: Kinds of solutions - Solubility of gases in liquids – Henry's law and its applications Colligative properties - Osmotic pressure - Laws of osmotic pressure - Reverse osmosis and its applications - Determination of molecular mass using colligative properties.

Module IV: Electrochemistry (12 hrs)

Specific conductance, equivalent conductance and molar conductance - Variation of conductance withdilution - Kohlrausch's law - Degree of ionization of weak electrolytes - Application of conductancemeasurements – Conductometric titrations.Galvanic cells - Cell and electrode potentials - IUPAC sign convention – Reference electrodes – Standardhydrogen electrode and calomel electrode – Standard electrode potential - Nernst equation - Cation andanion reversible electrodes – H2-O2 fuel cell.Ostwald's dilution law – Hydrolysis of salts - Buffer solutions – Henderson's equation – Applications of buffers.

References

1. B.R. Puri, L.R. Sharma and M.S. Pathania, *Principles of Physical Chemistry*, 46th Edition, Vishal Publishing Company, New Delhi, 2013.

2. J. Rajaram and J.C. Kuriacose, *Chemical Thermodynamics*, Pearson Education, New Delhi,2013.
3. K.K. Sharma and L.K. Sharma, *A Textbook of Physical Chemistry*, 5th Edition, Vikas Publishing House, New Delhi, 2012.

4. Gordon M. Barrow, *Physical Chemistry*, 5th Edition, Tata McGraw Hill Education, New Delhi,2006.
5. F. Daniels and R.A. Alberty, *Physical Chemistry*, 5th Edition, John Wiley and Sons, Canada, 1980.

SJSDC2MB3	ENVIRONMENTAL & INDUSTRIAL MICROBIOLOGY

Course No: 2.4
Course Code: SJSDC2MB3

Course Name: Environmental & Industrial Microbiology

Credits: 5
Hours:75

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO 1	Evaluate the significance of microbes in soil, air, water environments	PO3/ PSO1	R, U	F	24	-
CO 2	To analyse the various concepts of waste management	PO5/ PSO1	A	P	10	-
CO 3	To verify the bioremediatory role of microbes	PO7/ PSO1	A	F	11	-
CO 4	Evaluate the basic principles of Fermentation Technology	PO3/ PSO1	E	C	10	-
CO 5	To analyse the industrial significance of microbes	PO3/ PSO1	Z	C	25	-
CO 6	To understand the different concepts of intellectual property rights	PO8/ PSO1	U	C	10	-

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***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

SJSDC2MB3. ENVIRONMENTAL & INDUSTRIAL MICROBIOLOGY

5 hours / week 5 credits

SECTION I: ENVIRONMENTAL MICROBIOLOGY

Unit 1- 10 hrs

Microbiology of air – atmospheric layers, organisms in air, distribution and sources. Disease forecasting in plants.Indoor and outdoor air. Droplet nuclei, aerosol, infectious dust. Microbiological

sampling of air - gravity slide, plate exposure, vertical cylinder, Hirst spore trap, Rota rod sampler, Andersen sampler, Burked trap, hand held air sampler, impingers and filtration. Advantages and disadvantages of these techniques. Brief account of air borne transmission of harmful microbes and Air borne infections.

Unit 2 -14 hrs

Aquatic Microbiology: Aquatic environment, distribution of microorganisms in aquatic environment – fresh water, estuarine and marine water systems. Factors influencing growth and distributions. Water Purification procedures for single dwelling and municipal water supplies, Concept of indicator organisms, Microbiological examination of water. BOD, COD, Waste water treatment steps and methods. Eutrophication and algal bloom.

Unit 3 -10 hrs

Solid waste management: Sources and types of solid waste, need for management, Land fills, composting, vermi- composting, anaerobic digesters, methanogenesis and production of biogas. Design and management of biogas plant.

Unit 4 -11 hrs

Xenobiotic metabolism – Novel pollutants, persistance and biomagnification, Recalcitrant halocarbons, nitroaromatic compounds, PCB, dioxins, synthetic polymers, alkyl benzyl sulphonates, and petroleum hydrocarbons – their biodegradation. Bioremediation of polluted environment – Oil spills, heavy Metals and other xenobiotics. Microbial leaching and corrosion of metals.

SECTION2: INDUSTRIAL MICROBIOLOGY

Unit-1 10hrs Basic Concepts of Fermentations: - Fermentor – Components, Types of fermentors- Batch, Fedbatch, Continuous, liquid state, Solid State fermentors. Control systems in fermentation – sterilization, pH, Temperature, Oxygen and aeration, agitation, foam. Computer applications in fermentation technology.

Unit-2 8hrs Industrially important microorganisms - Screening Techniques- Primary and Secondary Preservation of cultures - Strain improvement- Development of inoculum for various fermentation processes. Media formulations – Water, carbon and nitrogen source, growth factors, precursors, minerals, buffers, aeration, antifoam agents, inhibitors, precursors and inducers.
Unit-3 4hrs Downstream processing :- Extraction and purification of intracellular and extra cellular products.
Unit-4 13hrs Microbial production of Wine, Ethanol. Acetone/ butanol by Clostridium species. Organic acids - Citric acid and Lactic acid, Acetic acid. Enzyme - Alpha amylase by bacteria and fungus. Vitamin B12 by streptomyces sp, Antibiotics – Penicillin. Steroid transformations

Unit-5 10hrs Introduction to intellectual property and intellectual property rights – types: patents, copy rights, trade marks, design rights, geographical indications – importance of IPR – patentable

and non patentables – patenting life – legal protection of biotechnological inventions – world intellectual property rights organization (WIPO).

Suggested Readings.

1. Microbial Ecology by Ronald M. Atlas, Richard Bartha.

2. Microbiology concepts and applications by Pelzar et a.l

3. Microbiology by Prescott.

4. Fundamentals of Microbiology by Mertus Frobisher.

5. A Hand book of water and waste water microbiology by Mara and Niger Horan.

6. Microbiological Examination Methods of Food and Water By Silva

7. Text book of Biotechnology by BD Singh

8. Text book of Microbiology by Chakrabarthy

9. Microbial Ecology. John Wiley & Sons.

10. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.

11. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.

12. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.

13. Industrial Microbiology by Prescott and Dunns.

14. Principles of Fermentation Technology. Mannual of Industrial Microbiology and Biotechnology by Demain and Devis.

15. Principles of Fermentation Technology by Stanburry and Whitaker

16. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.

17. Comprehensive Biotechnology by Murray and Moo Yung.

18. Sivakumar PK, Joe MM and Sukesh K (2010). An introduction to Industrial Microbiology. First edition, S.Chand & Company Ltd, New Delhi.

19. Agrawal AK and Pradeep Parihar (2006). Industrial Microbiology. Student edition, Jodhpur.

20. Patel AH (2005). Industrial Microbiology. Published by Mac Millan India Ltd., Chennai

21. Stanbury PF, Whitaker A and Hall SJ (1997). Principles of Fermentation Technology. Second edition, Pergmon Press.

22. LE Cassida JR (2005). Industrial Microbiology. New Age International (P) Ltd., New Delhi.

23. D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry,* 6th Edition, Saunders College Publishing, Fort Worth (1992).

24. W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).

25. J.W. Robinson, *Undergraduate Instrumental Analysis*, 5th Edition, Marcel Dekker, Inc., New York (1995).

26. D.R. Redsicker, *The Practical Methodology of Forensic Photography*, 2nd Edition, CRC Press, Boca Raton (2000).

SJSDC2FSC3	Criminology, Penology, Victimology, Forensic Psychology & Instrumentation Techniques

Course No: 2.5
Course Code:SJSDC2FSC3

Course Name: Criminology, Penology, Victimology, Forensic Psychology & Instrumentation Techniques
Credits: 5
Hours: 75

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions(appr.)	Lab (Hrs)
CO1	Evaluate the basic principles of criminology, penology, victimology	PO1/PSO2	E	F	18	-
CO2	Understand the biological psychological perspectives in criminal behavior	PO1/PSO2	U	F	18	-
CO3	Evaluate the significance of psychology in forensic investigations	PO1/PSO2	E	F	18	-
CO4	Understand Statistics	PO1/PSO2	U	F/P	10	-
CO5	Evaluate the principles of forensic instrumentation	PO1/PSO2	E	F	14	-

	techniques					
CO6	Evaluate Fundamental Principles of Microscopy	PO1/PSO2	E	F	8	-

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COURSE OUTLINE

SJSDC2FSC3- CRIMINOLOGY, PENOLOGY, VICTIMOLOGY, FORENSIC PSYCHOLOGY & INSTRUMENATION TECHNIQUES

5hrs/ week 5 credits

SECTION I Criminology, Penology, Victimology, Forensic Psychology

Module I: Basics of Criminology, Penology, Victimology (18 hrs)

Definition, aims and scope. Theories of criminal behaviour – classical, positivist, sociological. Criminal anthropology. Understanding modus operandi. Investigative strategy. Role of media. Crime- Elements, nature, causes and consequences of crime. Deviant behaviour. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence. White collar crimes, Victimology. Juvenile delinquency. Social change and crime. Psychological Disorders and Criminality. Situational crime prevention. Penology- Meaning, Definition and Scope, Meaning and Importance of Punishment, Punishment in ancient and modern times, History of correctional administration, Different prisons, Prison Acts, Theories of punishment. Treatment- Institutional, Non-institutional.

Module II: Psychology and criminal behavior (18 hrs)

Crime-biological factors, Biological perspective – nervous system:- central nervous system, structure and functions of CNS, peripheral nervous system. Endocrine system:- pituitary 22 gland, thyroid gland, neurotransmitters. socio learning theories, psycho-social factors, Theories of offending- social cognition, moral reasoning, Psychopathology and personality disorders, Psychological assessment, Ethical issues of forensic psychology.

Module III: Basics of Forensic Psychology (18 hrs) Definition and fundamental concepts of forensic psychology and forensic psychiatry, Psychological evidence, Eyewitness testimony, Confession evidence, Criminal profiling, Psychology in the courtroom with special reference to section 84IPC. Tools for detection of deception- interviews, nonverbal detection, statement analysis, voice. Stress analysis, hypnosis, case study methods. Polygraphy- operational and question formulation techniques, ethical and legal aspects**.** Narco analysis and brain mapping – principle and theory, ethical and legal issues.

Module IV: Statistical methods (10 hrs) Measures of central tendency:- Mean, Median and Mode Measures of dispersion:- Range, Mean Deviation, Variance, Standard Deviation, Coefficient of variation. Correlation and regression (brief account). Probability:-Laws of probability. Addition theorem & Multiplication theorem. Probability Distribution:- Binomial Distribution, Normal Distribution and Poisson distribution Test of hypothesis:- Null hypothesis, Alternate hypothesis Chi-square test and t-test.

SECTION 2: Instrumentation Techniques

Unit I: Instrumentation (14 hrs)

Sample preparation for chromatographic and spectroscopic evidence. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography. Spectroscopic methods. Fundamental principles and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law. Electrophoresis – fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

Unit 2: Microscopy and Forensic photography (8 hrs)

Fundamental principles. Magnification, Resolution, Different types of microscopes. Compound microscope, Comparison microscope, Electron microscope. SEM, TEM, Stereomicroscope Polarization and application Forensic applications of microscopy. Basic principles and applications of photography in forensic science. 3D photography. Photographic evidence. Infrared and ultraviolet photography. Digital photography. Videography. Crime scene and laboratory photography.

Recommended Reading:

1. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

2. D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton (2002).

3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).

4. J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester (1997).

5. R. Gupta, *Sexual Harassment at Workplace,* LexisNexis, Gurgaon (2014)

6. Jasra. P.K. and Raj Gurdeep 2000. Biostatistics.

7. Khan, I.A. and Khayum. Fundamentals of Biostatistics. Wraaz Publ. Hyderabad.

8. Norman, T.J. Bailey. Statistical methods in Biology Cambridge Univ. Press.

9. Prasad, S. 2003. Elements of Biostatistics. Rastogi Publ.

10. Ramakrishnan, P. Biostatistics, Saras Publishers.

SJSDC2MB4 (P)	Practicals on Environmental, Industrial Microbiology & Instrumentation Techniques

Course No: 2.6

Course Code: SJSDC2MB4 (P)

Course Name: Practicals on Environmental, Industrial Microbiology & Instrumentation Techniques

Credits: 4

Hours: 60

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To analyse various cell disruption techniques	PO3/PSO3	Z	F,P	-	8
CO2	To evaluate modes of fermentation techniques	PO3/PSO3	E	P	-	16
CO3	To evaluate the microbial production of industrially relevant products	PO3/PSO3	E	P	-	16
CO4	To apply the concepts of various analytic instruments in practise	PO3/PSO3	A	P	-	16

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COURSE OUTLINE

SJSDC2MB4 (P)-PRACTICAL RELATED TO ENVIRONMENTAL, INDUSTRIAL MICROBIOLOGY & INSTRUMENTATION TECHNIQUES

4hours/ week 4**credits**

1. Differences in abrupt and gradual scale up of inoculum.

2. Enrichment of coir pith degraders.

3. Sterilization problems with suspended solids in media.

4. Demonstration of SSF, fixed bed and fluidized bed systems.

5. Pellicle formation.

6. Cell disruption techniques.

7. Isoelectric focusing.

8. Salting out.

9. Bioassay.

10. Production of alcohol from fruit juice.

11. Microbiological assay of penicillin.

12. Production of citric acid using Aspergillus.

13. To carry out thin layer chromatography of ink samples.

14. To determine the concentration of a colored compound by colorimetry analysis.

15. To carry out separation of organic compounds by paper chromatography.

16. To identify drug samples using UV-Visible spectroscopy.

SJSDC2MB/FSC (Pr1)	Mini Project

Course No: 2.7

Course Code: SJSDC2MB/FSC (Pr1)

Course Name: Mini Project

Credits: 4

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate and conduct internship and project in the field of forensic science OR Microbiology	PO1/PSO4	E	P	-	20
CO2	Acquiring Independent research skills	PO1/PSO4	U	F/C	-	20
CO3	Create and develop problem solving, critical thinking and decision making skills	PO1/PSO4	C	P/F	-	20

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***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

Mini Project on either Forensic Science or Applied Microbiology as per students interest.

Semester III									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
3.1	SJGEC3EG07	Writing for academic & professional success A03	4	20	80	100	4		4
3.2	SJGEC3ZO08	Zoology I	4	20	80	100	4		4
3.3	SJGEC3CH09	Chemistry III	4	20	80	100	4		4
3.4	SJSDC3MB5	Food, Dairy & Agricultural Microbiology	5	20	80	100	5		5
3.5	SJSDC3 FSC4	Forensic Chemistry & Toxicology	5	20	80	100	5		5
3.6	SJSDC3MB6 (P)	Practical on Food, Dairy & Agricultural Microbiology (3.4)	4	20	80	100		4	4
3.7	SJSDC3FSC5 (P)	Practical on Forensic Science II (2.5, 3.5)	4	20	80	100		4	4
		Semester III Total	**30**			**700**	**22**	**8**	**30**

SJGEC3EG07	Writing for academic & professional success A03

COURSE CODE: SJ**GEC3EG07**

Module 1: The Process of Writing

Introduction to Academic writing: What is academic writing - Purpose of academic writing - Types of academic writing - Features of academic writing.

Structuring the Essay: Planning an essay- Brain-storming- Organizing and outlining - Writing a thesis statement - Nature of supporting sentences - Writing paragraphs- Structure of an essay.

SJGEC3ZO08	Zoology I

Vocabulary for Writing: Selection of vocabulary- Abbreviations- Choice of nouns and adjectives- Appropriate verbs and adverbs- Conjunctions and prepositions- Prefixes and suffixes- Synonyms- Common errors.

Composing the Content: Writing introductions and conclusions- Ordering the paragraphs - Proof-reading and editing- Finalising the final draft.

Module 2: Elements of Writing

Shaping Strategies: Discussions, persuasions and arguments- Comparison and contrast- Cause and effect- Defining and classifying problems and solutions
Mechanics and conventions of writing: Punctuations, Use of articles, Relevance of examples, Generalizations, Academic style.

Module 3: Writing for Professional Purposes I

Writing Reviews: Reviewing books – Reviewing movies - Writing product reviews
Writing Case Studies
Writing Reports: Feasibility report, Progress reports, Evaluative reports
Surveys: Conducting surveys- Designing questionnaires, Collecting data - Writing descriptive reports

Module 4: Writing for Professional Purposes II

Writing CVs
Letter Writing: Transmittal and cover letters - Emails
Writing summaries
Writing memos
On writing blogs
Etiquette in writing

Core Text:

Code	Title	Author	Publisher
ENG2 A03	WRITING FOR ACADEMIC AND PROFESSIONAL SUCCESS	Dr. Jacob George & Dr. Anwar Sadath	University of Calicut

SJGEC3ZO08	Zoology I

Course No: 3.2
Course Code: SJGEC3ZO08
Course Name: **Zoology I**

Credits: 4

COURSE OUTLINE

ANIMAL DIVERSITY & WILD LIFE Code: SJGEC3ZO08 (60 hours) (4 hours per week) (Credits - 4)

A. Animal Diversity 30 hrs

The study of animal diversity is based on types with emphasis on structural organisation and classification down to classes with examples.

I. Type for detailed study 18 hrs

1. Penaeus (6 hrs) Exclude details of larval stages).

2. Oryctolagus (12 hrs) [Exclude skin, skull bones, arterial system, venoussystem, lymphatic system,autonomous nervous system and endocrimessystem].

II. Classification 12 hrs

An outline of 5 kingdom classification.Kingdom: Protista: Salient features, classification including sub kingdom.

Names only. Special reference on sub kingdom with salient features Eg:-Noctiluca & Vorticella. Kingdom Animalia (Only salient features, mention classes) Phylum Porifera Eg: Leucosolenia

Phylum Coelenterata Eg: Obelia

Phylum Plalyhelminthes Eg: Fasciola, Schistosoma

Phylum Aschelminthes Eg: Ascaris

Phylum Annelida Eg: Arenicola, Hirudinaria

Phylum Arthropoda Eg: Limulus, Peripatus, Sacculina, Eupagurus Belostoma

Phylum -Mollusca Eg: Chiton, Perna, Teredo & Sepia

Phylum Echinodermata Eg: Asterias & HolothuriaSub phylum Urochordata Eg: Ascidia

Subphylum Cephalochordata Eg: Branchiostoma

Subphylum Vertebrata : Agnatha Eg: Petromyzon

Super class Pisces : Class: Chondrichthyes Eg: Narcine Class: Osteichthyes Eg: Echeneis, Hippocampus and Heteropneustes

Super class Tetrapoda Class Amphibia Eg: Ichthyophis, Salamandra and Rhacophorus Class Reptilia Eg: Chamaeleo, Daboia & Tortoise Class Aves Eg: Columba Class Mammalia Eg: Pteropus

B. Wild life (6 hrs)

I. Threats to Biodiversity II. Wild life management and conservation Mention Protection Acts. III. Sustainable development IV. Red data Book & IUCN Assignments

Teachers can suggest topics of Assignments / Seminars for internal evaluation only.

References

1. Jordan E.L. & Verma, P.S. Invertebrte Zoology S. Chand & Co.
2. Jordan E.L. & Verma, P.S. Vertebrate Zoology s. chand & Co.
3. Kotpal, R.L. Modern Text Book of Zoology Rastogi Publi. Vertebrate & Invertebrates
4. Soper, R. et al. Biological Sciences, Cambridge University Press.
5. Rajesh Gopal. Wild life Biology.

6. Ekambraanatha Ayyar, M. & Ananthakrishnan, T.N. Manual of Zoology,
Vol. I (Part I & II), S. Viswanathan, Madras.
7. Encarta: 2004 Edn or earlier versions (CDs), Microsoft.
8. Encyclopedia Beritannica: 2004 Edn. or earlier versions (CDs),
Britannica.com.India.
9. Ahluwalia,V.K. and Sunitha Malhotra-Environmental Science,Ane Books
Pvt.Ltd.
http://www.ucomp.berkeley.edu.
http://www.mbl.edu.
http:phylogeny.cornell.edu
http://www.ent.castate.edu.

SJGEC3CH09	Chemistry III

Course No: 3.3
Course Code: SJGEC3CH09

Course Name: Chemistry III
Credits: 4
Hours: 60

COURSE OUTLINE

ORGANIC CHEMISTRY

Module I: Organic Chemistry – Some Basic Concepts (9 hrs)

Introduction: Origin of organic chemistry – Uniqueness of carbon – Homologous series – Nomenclatureof alkyl halides, alcohols, aldehydes, ketones, carboxylic acids and amines. Structural isomerism: Chainisomerism, position isomerism, functional isomerism and metamerism. Hybridisation in organicmolecules (a brief study) - Curved arrow formalism - Homolysis and heterolysis of bonds – Electrophilesand nucleophiles.*Electron Displacement Effects*: Inductive effect: Definition - Characteristics - +I and -I groups.Applications: Explanation of substituent effect on the acidity of aliphatic carboxylic acids. Mesomericeffect: Definition – Characteristics - +M and -M groups. Applications: Comparison of electron density inbenzene, nitrobenzene and aniline. Hyperconjugation: Definition – Characteristics. Example: Propene.Applications: Comparison of stability of 1 -butene & 2-butene. Electromeric effect: Definition Characteristics - +E effect (addition of H+ to ethene) and -E effect (addition of CN- to acetaldehyde).Steric effect (causes and simple examples).*Reaction Intermediates*: Carbocations, carbanions and free radicals (types, hybridization and stability).

Module II: Stereochemistry (6 hrs)

Conformations: Conformations of ethane, cyclohexane and methylcyclohexane - Explanation of stability.*Geometrical Isomerism:* Definition – Condition – Geometrical isomerism in but-2-ene and but-2-ene-1,4-dioic acid - Methods of distinguishing geometrical isomers using melting point and dipole moment. *Optical Isomerism:* Optical activity – Chirality – Enantiomers - Meso compounds - Diastereoisomers –

Optical isomerism in lactic acid and tartaric acid - Racemisation and resolution (elementary idea).

Module III: Aromatic Hydrocarbons (6 hrs)

Nomenclature and isomerism in substituted benzene. Structure and stability of benzene: Kekule, resonance and molecular orbital description.Mechanism of aromatic electrophilic substitution: Halogenation, nitration, sulphonation and FriedelCraft's reactions - Orientation effect of substituents. Aromaticity and Huckel's rule: Application to benzenoid (benzene, naphthalene and anthracene) and nonbenzenoid (pyrrole, pyridine, indol and tropylium cation) aromatic compounds.

Module IV: Chemistry of Functional Groups – I (9 hrs)

Halogen Compounds: Preparation of alkyl halides from alkanes and alkenes - Wurtz reaction and Fittig's reaction - Mechanism of SN1 and SN2 reactions of alkyl halides – Effect of substrate and stereochemistry.
Alcohols: Preparation from Grignard reagent - Preparation of ethanol from molasses - Wash, rectified spirit, absolute alcohol, denatured spirit, proof spirit and power alcohol (mention only) – Comparison of acidity of ethanol, isopropyl alcohol and *tert*-butyl alcohol - Haloform reaction and iodoform test Luca's test - Chemistry of methanol poisoning – Harmful effects of ethanol in the human body.

Phenols: Preparation from chlorobenzene – Comparison of acidity of phenol, *p*-nitrophenol and *p*methoxyphenol – Preparation and uses of phenolphthalein. *Ethers:* Preparation by Williamson's synthesis – Acidic cleavage - Crown ethers (mention only).

Module V: Chemistry of Functional Groups – II (9 hrs)

Aldehydes & Ketones: Preparation from alcohols – Nucleophilic addition reactions (HCN and bisulphite)- Comparison of nucleophilic addition rate of aliphatic aldehydes and ketones – Preparationandimportance of urotropine.*Carboxylic Acids:* Preparation from Grignard reagent - HVZ reaction – Decarboxylation – Kolbeelectrolysis.*Nitro Compounds:* Preparation of TNT – Reason for its explosive nature - Preparation of picric acid fromphenol.*Amines:* Preparation from nitro compounds - Hofmann's bromamide reaction – Hofmann's carbylamines reaction. Basicity: Comparison of basicity of (i) ammonia, methyl amine and aniline (ii) aniline, Nmethyl aniline and N,N-dimethyl aniline (iii) aniline, *p*-nitroaniline and *p*-anisidine.*Diazonium Salts*: Preparation and synthetic applications of benzene diazonium chloride –Preparation anduses of methyl orange.

Module VI: Biomolecules (12 hrs)

Carbohydrates: Classification with examples – Cyclic structures of glucose, fructose and sucrose – Mutarotation – Starch, cellulose and glycogen – Applications of carbohydrates.
Proteins: Amino acids – Classification – Zwitter ion formation - Peptide linkage - Polypeptides and proteins – Primary, secondary and tertiary structure of proteins - Globular and fibrous proteins – Denaturation of proteins. Enzymes: Characteristics and examples.
Lipids: Classification – Fats, oils and waxes (definition, structure and examples) – Saponification numberand iodine number – Hydrogenation of oils and its application.
Nucleic acids: Structure of pentose sugar, nitrogenous base, nucleoside and nucleotide – Double-

helicalstructure of DNA - Difference between DNA and RNA – DNA fingerprinting and its applications.

Module VII: Alkaloids and Terpenes (3 hrs)

Alkaloids: Classification – Source, structure and physiological functions of nicotine, coniine and piperine.*Terpenes:* Classification with examples – Isoprene rule – Isolation of essential oils by steam distillation –Uses of lemongrass oil, eucalyptus oil and sandalwood oil - Source, structure and uses of citral andmenthol - Natural rubber - Vulcanization and its advantages.*Note: Structural elucidation not expected in any case.*

References

1. L.G. Wade Jr., *Organic Chemistry*, 6th Edition, Pearson Education, New Delhi, 2013.
2. P.Y. Bruice, *Essential Organic Chemistry*, 1 st Edition, Pearson Education, New Delhi, 2013.
3. I.L. Finar, *Organic Chemistry Vol. I&II*, 5th Edition, Pearson Education, New Delhi, 2013.
4. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (P) Ltd., New Delhi, 2004.

5. A. Bahl and B.S. Bahl, *Advanced Organic Chemistry*, 1 st Multicolour Edition, S. Chand & Company, New Delhi, 2010.

6. C.N. Pillai, *Organic Chemistry for Undergraduates*, 1 st Edition, University Press, Hyderabad, 2008.
7. M.S. Singh, *Advanced Organic Chemistry: Reactions and Mechanisms*, Pearson Education, New Delhi, 2014.

SJSDC3MB5	Food, Dairy & Agricultural Microbiology

Course No: 3.4
Course Code: SJSDC3MB5
Course Name: Food, Dairy & Agricultural Microbiology

Credits: 5 4
Hours: 75

	Course Outcome	POs/ PSOs	CL	K C	Class Sessions (appr.)	La b (H rs)
CO1	Evaluate the contributory role of microbes in food science & dairy science	PO7/P SO1	R,U, E	C	13	-
CO2	To analyse the various principles of food spoilage & poisoning	PO2/P SO1	Z	C	20	-

CO3	To evaluate the various food preservation techniques	PO3/PSO1	E	F	12	-
CO4	Evaluate the basics of agricultural Microbiology	PO1/PSO1	E	F	10	-
CO5	To analyse the different types of biological interactions	PO1/PSO1	Z	F	10	-
CO6	To evaluate the concepts of plant pathology	PO2/PSO1	E	C	12	-
CO7	To analyse the microbial applications in agriculture	PO3/PSO1	Z,A	P	13	-

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

SJSDC3MB5-FOOD, DAIRY & AGRICULTURAL MICROBIOLOGY

5 hours /week 5 credits

SECTION1: FOOD & DAIRYMICROBIOLOGY

Unit 1- 2 hrs. Food as a substrate for microorganisms. Types of microorganisms in food – Source of contamination – Factors influencing microbial growth in foods (extrinsic and intrinsic) Microbial examination of food- viable colony count, examination of fecal Streptococci.

Unit 2- 4 hrs Physical and chemical properties of milk. Milk as a substrate for microorganisms. Types of microorganisms in Milk-bacteria, fungi and yeast. Sources of microbial contamination of milk. Microbiological analysis of milk. Rapid platform tests- organoleptic, Clot on boiling (COB), turntable acidity alcohol test, DMC, sedimentation test and pH. Standard plate count, MBRT.

Unit 3- 7hrs. Food fermentations: Cheese, bread, yoghurt, idli, fermented pickles and fermented vegetables, Ice cream, – methods and organisms used. SCP, Probiotics and prebiotics.

Unit 4 -10hrs General principles underlying spoilage, Spoilage different kinds of foods, cereals and cereal products – sugar and sugar products – vegetable and fruits – meat and meat products – fish and other sea foods – eggs and poultry – dairy and fermentative products (ice cream/milk/bread/wine).

Unit 5- 10hrs. Food Poisoning : food borne infections (a) Bacterial: Staphylococcal, Brucella, Bacillus, Clostridium, Escherichia, Salmonella (b) Fungal : Mycotoxins including aflatoxins, ergotism (c) Viral: Hepatitis, (d) Protozoa – Amoebiasis.

Unit 6- 12hrs. Food preservation: Principles of food preservation – methods of preservation. a. Physical (irradiation, drying, heat processing, pasteurization, chilling and freezing, high pressure and modification of atmosphere) b. Chemical (Sodium benzoate Class I & II). Food Sanitation: Good manufacturing practices – HACCP, Presonnel hygiene.

SECTION2: AGRICULTURAL MICROBIOLOGY

Unit 1 -4 hrs. Introduction to soil Microbiology – Properties of soil (structure, texture, formation). Types and significance of soil microbes – Factors affecting microbial population - Soil fertility test. **Unit 2 -**6 hrs. Biogeochemical cycle –Role of microorganisms in Carbon, Phosphorous, Nitrogen and sulfur cycles.

Unit 3- 10 hrs.**Biological Interactions** Microbe–Microbe Interactions. Mutualism, Synergism, Commensalism, Competition, Amensalism, Parasitism, Predation. Microbe–Plant Interactions.Roots-Rhizosphere and *Mycorrhizae*, Aerial Plant surfaces, Microbe–Animal Interactions. Role of Microbes in Ruminants, Nematophagus fungi, Luminescent bacteria as Symbiont

Unit 4- 12 hrs. **Plant pathology** (symptoms, disease cycle and control measures) – Bacterial diseases - Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, bacterial cankers of citrus Fungal disease- Wilt of tomato - *Fusarium oxysporum* Red rot of sugarcane - *Colletotrichum falcatum*, Early blight of potato - *Alternaria solani* Wilt of cotton , Viral diseases- Papaya ring spot, tomato yellow leaf curl, banana bunchy top.

Unit 5 - 13 hrs.**Applications of microbes in agriculture** : Biofertilizers. Symbiotic nitrogen fixation – (Rhizobium, Frankia) –Symbiotic nutrient mobilizers – Endomycorrhizae and Ectomycorrizae. Non symbiotic microbes – Azotobacte . Associative Symbiosis – Azospirillum. Cyanobacteria (Nostoc. Gloeocapsa), Azolla-Anabaena System Bio pesticides- bacterial, fungal and viral, Advantages over the chemical counter parts.

Suggested Readings.

1. Food Microbiology by Adams, M.R. and Moss, M.O.1995.The Royal Society of Chemistry, Cambridge.

2. Food Microbiology by Frazier, W.C. and Westhoff, D.C.1988.TATA McGraw Hill Publishing company ltd., New Delhi.

3. Modern Food Microbiology by Jay, J.M.1987.CBS Publishers and distributors, New Delhi.

4. Basic Food Microbiology by Banwart, G.J.1989.Chapman & Hall New York.

5. A Modern Introduction to Food Microbiology by Board, R.C.1983.Blackwell Scientific Publications, Oxford.

6. Dairy Microbiology by Robinson, R.K.1990. Elsevier Applied Science, London.

7. Food Poisoning and Food Hygiene, Hobbs, B.C. and Roberts, D.1993. Edward Arnold.

8. MICROBIOLOGICAL EXAMINATION METHODS OF FOOD AND WATER by SILVA
9. Lund BM, Baird Parker AC, and Gould GW. (2000). *The Microbiological Safety and Quality of Foods*. Vol. 1-2, ASPEN Publication, Gaithersberg, MD.
10. Gould GW. (1995). *New Methods of Food Preservation*. Blackie Academic and Professional, London.

11. Microbial Ecology. John Wiley & Sons, Inc., New York 2.

12. Introduction to Soil Microbiology by Alexander, M.(1977). John Wiley & Sons, Inc.,
13. Agricultural microbiology, 2nd edition. Rangaswami G., Bagyaraj D. J. Prentice hall of India.

14. Ronald M. Atlas., Richard Bartha. Microbial Ecology. Benjamin Cummings. 1998
15. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York edition. Pearson Education.
16. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.

1 7. Subba Rao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.

1 8. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.

19. Devlin RM. (1975). *Plant Physiology*. 3 rd edition, Willard Grant Press.
20. Stolp H. (1988). *Microbial Ecology: Organisms Habitats Activities*. Cambridge University Press, Cambridge, England.
21. Agrios GN. (2006). *Plant Pathology*. 5th edition. Academic press, San Diego,
22. Lucas JA. (1998). *Plant Pathology and Plant Pathogens*. 3 rd edition. Blackwell Science, Oxford.
23. Mehrotra RS. (1994). *Plant Pathology*. Tata McGraw-Hill Limited.
24. Rangaswami G. (2005). *Diseases of Crop Plants in India*. 4th edition. Prentice Hall of India Pvt. Ltd., New Delhi.
25. Singh RS. (1998). *Plant Diseases Management*. 7th edition. Oxford & IBH, New Delhi.

SJSDC3 FSC4	Forensic Chemistry & Toxicology

Course No: 3.5
Credits: 5
Hours: 75

Course Code: SJSDC3FSC4

Name of the Course: Forensic Chemistry & Toxicology

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate the principle and significance of forensic chemistry	PO1/PSO2	E/A	F	15	-
CO2	Evaluate the role of toxicology in forensics	PO1/PSO2	E/A	F	20	-
CO3	Awareness on Narcotics, Drugs and Psychotropic substance	PO1/PSO2	U	F	19	-

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COURSE OUTLINE

SJSDC3 FSC4- FORENSIC CHEMISTRY & TOXICOLOGY

5hrs/week 5 credits

SECTION I: Forensic Chemistry & Toxicology

Module I: Petroleum and Petroleum Products (15 hrs)

Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.

Module II: Basics of Toxicology and Poisons (20 hrs)

Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests. Postmortem Toxicology. Human performance toxicology. Dose-response relationship. Lethal dose 50 and effective dose 50. Classification of poisons. Physico-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings. Signs and symptoms of common poisoning and their antidotes. Collection and preservation of viscera, blood and urine for various poison cases. Identification of biocides and metal salts in body fluids. Metabolism and excretion of poisons. Application of immunoassays in forensic work. Animal

poisons. Snake venom. Mode of action. Carbon monoxide poisoning. Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms. Beverages. Alcoholic and nonalcoholic illicit liquors. Analysis and identification of ethyl alcohol. Estimation of ethyl alcohol in blood and urine. Proof spirit. Crime scene management in illicit liquor cases.

Module III: Narcotics, Drugs, Psychotropic Substances and Alcoholic Beverages (19 hrs)

Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances. Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substances**.** Crime scene search for narcotics, drugs and psychotropic substances – searching a suspect, searching a dwelling, searching a vehicle. Clandestine drug laboratories. Collection and preservation of drug evidence. Testing of narcotics, drugs and psychotropic substances. Isolation techniques for purifying narcotics, drugs and psychotropic substances – thin layer chromatography, gas-liquid chromatography and high performance liquid chromatography. Presumptive and screening tests for narcotics, drugs and psychotropic substances. Microcrystalline testing of drugs of abuse. Analysis of narcotics, drugs and psychotropic substances in breast milk, saliva, urine, hair and antemortem blood. Drugs and driving. Dope tests. Analysis of narcotics, drugs and psychotropic substances in postmortem blood. Postmortem changes affecting the analysis of narcotics, drugs and psychotropic substances.

Recommended Reading:

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).

2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).

3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
4. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition, Oxford University Press, New York (1983).
5. S.B. Karch, *The Pathology of Drug Abuse*, CRC Press, Boca Raton (1996).
6. A. Poklis, Forensic toxicology in, *Introduction to Forensic Sciences*, 2nd Edition, 31 W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
7. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, *Alcohol, Drug and Driving*, 4, 99 (1988)

SJSDC3MB6(P)	Practical on Food, Dairy & Agricultural Microbiology (3.4)

Course No: 3.6
Course Code: SJSDC3MB6(P)
Course Name: Practical on Food, Dairy & Agricultural Microbiology (3.4)
Credits: 4
Hours: 60

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To analyse the role of microbes in soil & environment	PO3/ PSO3	Z	P	-	16
CO2	To analyse the role of microbes in Dairy products	PO3/PSO3	Z	P	-	16
CO3	To evaluate the role nitrogen fixing microbes	PO3/PSO3	E,Z	P	-	16
CO4	To analyse plant diseases	PO3/PSO3	Z,A	P	-	16

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SJSDC3MB6(P)- PRACTICAL ON FOOD, DAIRY & AGRICULTURAL MICROBIOLOGY

4hours/ week4credits

1. Isolation and screening of industrially important microorganisms from soil/environment – cellulose digesting, amylase producing.
2. Aerobic mesophilic count of milk.
3. Isolation of constitutent flora of fermented milk.
4. Production of wine.
5. Methylene blue reductase test.
6. Isolation and Enumeration of bacteria and fungi from soil
7. Isolation of rhizobium and azotobacter.
8. Amonification and nitrification of organic compounds.
9. Demonstration of pigment production on nutrient agar medium (*Staphylococcus aureus, Pseudomonas aeruginosa and Serratia* spp.*)*
10. Examination of plant diseases

SJSDC3FSC5 (P)	Practical on Forensic Science II (2.5, 3.5)

Course No: 3.7
Credits: 4
Hours: 60

Course Code: SJSDC3FSC5(P)

Name of the Course: Practicals Related to Forensic Science II

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate Crime Cases which explains the criminal behavior	PO3/PSO3	E	P	-	12
CO2	Evaluate Victimology	PO3/PSO3	E	P	-	12
CO3	Evaluate Penology	PO3/PSO3	E	P	-	12
CO4	Familiarize the technique of data representation	PO3/PSO3	U	P	-	12
CO5	Quantitative & Qualitative analysis of Forensic exhibits	PO3/PSO3	Z	P	-	12

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SJSDC3FSC5 (P) PRACTICALS RELATED TO FORENSIC SCIENCE II

(based on C.No2.5, 3.5)

5 hrs/week 5credits

1. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.

2. To review crime cases where criminal profiling assisted the police to apprehend the accused.

3. To cite examples of crime cases in which the media acted as a pressure group.

4. To evaluate the post-trauma stress amongst victims of racial discrimination.

5. To correlate deviant behavior of the accused with criminality (take a specific example).

6. To evaluate victimology in a heinous crime.

7. To examine a case of juvenile delinquency and suggest remedial measures.

8. To evaluate how rising standards of living affect crime rate.

9. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.

10. To visit a 'Model Police Station' and examine the amenities vis-à-vis conventional police stations.

11. To examine steps being taken for rehabilitation of former convicts and suggests improvements.

12. To prepare a report on interrogation cells and suggest improvements.

13. Work out the problems related to mean, median, mode, standard deviation, probability, Chi-square test, t-test and correlation.

14. Familiarise the technique of data representation (tables, bar-diagram, histogram, pie-diagram and frequency curve (manual and using computer)

15. To carry out analysis of gasoline.

16. To carry out analysis of diesel.

17. To carry out analysis of kerosene oil.

18. To identify illicit drugs by spot tests.

19. To perform color tests for opiates.

20. To perform color tests for barbiturates.

21. To identify methyl alcohol.

22. To identify ethyl alcohol.

23. To identify biocides.

24. To identify metallic poisons.

25. To identify organic poisons.

26. To carry out quantitative estimation of ethyl alcohol.

27. To prepare iodoform.

28. To identify drugs of abuse by spot tests.

29. To perform colour tests for barbiturates.

30. To separate drugs of abuse by thin layer chromatography

Semester IV									
Course Code	Course Name	Credit	Marks			Hrs/week			
			Int	Ext	total	Th	Prac	Total	
SJGEC4EG10	Zeitgeist : Readings on society and cultures A04	4	20	80	100	4		4	
SJGEC4ZO11	Zoology II	4	20	80	100	4		4	
SJGEC4 CH12	Chemistry IV	4	20	80	100	4		4	
SJSDC4 FSC6	Forensic Physics, Ballistics, Dermatoglyphics & Questioned Documents	5	20	80	100	5		5	
SJSDC4MB7	Medical Microbiology and Immunology	5	20	80	100	5		5	
SJSDC4CH5 (P)	Practical on Chemistry (1.3,2.3.3.3,4.3)	4	20	80	100		4	4	
SJSDC4MB/FSC (Pr2)	Mini Project	4	0	100	100		4	4	
Semester IV total			**30**			**700**	**22**	**8**	**30**

SJGEC4EG10	Zeitgeist : Readings on society and culturesA04

Course Code	A04
Title Of The Course	Zeitgeist : Readings on society and culturesA04
Semester In Which The Course To Be Taught	**4**
No. Of Credits	4
No. Of Contact Hours	60 (4hrs/wk)

II COURSE DETAILS:

Module 1: Indian Constitution and Secularism

1. Preamble to the Constitution of India
2. Should Gandhi's Assassin be Killed?: Pearl S. Buck
3. Toba Tek Singh: Saadat Hassan Manto
4. The Flag: Kamala Das

Module 2: Sustainable Environment

1. The End of Living and the Beginning of Survival: Chief Seattle
2. On Killing a Tree: Gieve Patel
3. Zlateh the Goat: Issac Bashevis Singer

Module 3: Gender

1. The Story of an Hour: Kate Chopin
2. The First time I Uttered a Prayer: Lee Mokobe
3. Claiming an Education: Adrianne Rich

Module 4: Human Rights

1. Refugee Blues: W H Auden
2. Amnesty: Nadine Gordimer
3. Akkarmashi: Sarankumar Limbale (Extracts from Chapter 1)
4. The Meaning of Life: Yuval Noah Harari (Extracts from Chapter 19)

Code	Title	Author	Publisher
ENG2 A04	ZEITGEIST: READINGS ON CONTEMPORARY CULTURE	BoS, University of Calicut	University of Calicut

SJGEC4ZO11	Zoology II

Course No: 4.2
Course Code: SJGEC4ZO11

Course Name: Zoology II
Credits: 4

COURSE OUTLINE

SJGEC4ZO11-PHYSIOLOGY & ETHOLOGY

A. Physiology (36 hrs)

I. Trans membrane transport mechanism (4 hrs)

Structure of Plasma membrane, Fluid mosaic model, Passive & Activemechanisms, vesicular transport.
II. Nutrition: Absorption of nutrients, nervous and hormonal control of digestion, importance of fibre in the food, Anorexia, ulcer, obesity starvation and fasting (In brief). (3 hrs)

III. Respiration (4 hrs)

Gaseous exchange, Respiratory pigments, structure and properties of haemoglobin, gas transport, control of respiration, respiratory problem, Hypoxia, Asphyxia, CO2 poisoning or Cyanide poisoning, respiratory problem of high altitudes, problem of diving mammals, aspirators, artificial ventilation, heart lung machine, smoking and its ill effects.

IV. Body fluid and circulation (6 hrs)

Blood constituents, Mention agglutination and coagulation of blood, Haemostasis, Haemolysis and Jaundice, Blood transfusion (short notes).Structure and working of heart (in Brief). Electrical and Mechanicalproperties of Cardiac muscle, Pacemaker and Conducting system of heart.Cardiac cycle and regulation of heart beat. Blood pressure, pulse,cardiovascular problems (brief description). Arterio sclerosis and atherosclerosis, myocardial infraction, hypertension and thrombosis.

V. Osmoregulation & Excretion (6 hrs)

Osmoconformers, Osmoregulators, Water retention and Conservation indesert forms. Classification of animals based on nitrogen compoundsexcreted, Ammonotelism, Ureotelism, Uricotelism, Urea cycle.Hormonal control of kidney function, Kidney disorders, renal Hyper tension,Nephritis, Renal failure, dialysis and kidney transplantation (short notes).

VI. Muscle Physiology (6 hrs)

EM structure of myofibrils and myofilament, contractile proteins differenttypes. Chemistry and mechanism of muscle contraction, Energy supply,muscle twitch tetanus, isometric and isotonic contraction, summation ofstimuli, all or none law - fatigue rigour mortis.

VII.Nerve physiology (7 hrs)

Mention different types of nerve cells, glial cell, giant nerve fibre;neurotrophins excitation, impulse generation and transmission,electrochemical changes. Maintenance of resting potential, Action potential,threshold of stimulus, all or none response, synapsis, and myo neuraljunctions. Synaptic transmission, neuro transmitters. Scanning - MRI, CTetc.

Ethology (12 hrs)
Brief accounts of the following topics. Introduction
I. History, Scope and Branches of ethology (1 hr)
II. Innate behaviour (1 hr)
Orientation, taxes and kineses, simple reflexes and instincts, drive and
motivation.
III. Learned behaviour (2 hr)

Habituation, conditioned reflex, trial and error learning, latent learning, imprinting, insight learning (2 hrs)

IV. Patterns of behaviour (2 hrs)

Habitat selection, sexual selection, co-operation, protection, territoriality, aggression, courtship and agonistic behaviour.

V. Biological clocks/rhythm (1 hr)

Photoperiod, circadian rhythm, migration, navigation and homing instinct, diapause, hibernation, aestivation.

VI. Communication in animals (1 hr)

VII. Social organization in mammals. (2 hrs)

VIII. Proximate factors (2 hrs)

neurological basis of behaviour, mention hormonal, biochemical,environmental and genetic factors that influence behaviour.

Assignments

Teacher can suggest topics for Assignment / Seminar (for internal evaluation only).

Reference

Berry, A.K. A Text Book of Animal Physiology. Emkay Publications, Delhi, 51.
Chatterjee, C.C. Human Physiology. Medical Allied Agency.
Guyton. A.C & Hall. TB of Medical Physiology, Harcourt.
Goyal, K.A. & Sastry, K.V. Animal Physiology. Rastogi. Pub.
Rastogi, S.C. Essentials of Animal Physiology, Wiley Eastern.
Boinlanger, E.G. Animal Behaviour, 1994. ------ Pub.
Reena Mather. Animal Behaviour, 1994. Rosthogi Pub.
Sharma, P.D. Tolxicology.
Purohit, S.S. Ecology, Environment and Pollution, 2003, Agro.

SJGEC4 CH12	Chemistry IV

Course No: 4.3

Course Code: SJGEC4 CH12

Course Name: Chemistry IV-**PHYSICAL AND APPLIED CHEMISTRY**

Credits: 4

COURSE OUTLINE

PHYSICAL AND APPLIED CHEMISTRY

Module I: Colloidal Chemistry (6 hrs)

True solution, colloidal solution and suspension. Classification of colloids: Lyophilic, lyophobic,macromolecular, multimolecular and associated colloids with examples. Purification of colloids by electrodialysis and ultrafiltration. Properties of colloids: Brownian movement – Tyndall effect – Electrophoresis. Origin of charge and stability of colloids – Coagulation - Hardy Schulze

rule – Protectivecolloids - Gold number. Emulsions. Applications of colloids: Delta formation, medicines, emulsification,cleaning action of detergents and soaps.

Module II: Kinetics & Catalysis (9 hrs)

Kinetics: Rates of reactions - Factors influencing rate of reactions - Order and molecularity - Zero, first,second and third order reactions - Derivation of integrated rate equations for first order and secondorderreactions (single reactant only) - Half life period for first order reaction - Units of rate constants Influence of temperature on reaction rates - Arrhenius equation - Calculation of Arrhenius parameters Collision theory of reaction rate.*Catalysis:* Types of catalysis – Homogeneous and heterogeneous catalysis. Theories of catalysis: Outline of intermediate compound formation theory and adsorption theory.

Module III: Chromatography (6 hrs)

Introduction - Adsorption and partition chromatography - Principle and applications of column, thin layer, paper and gas chromatography - Rf value – Relative merits of different techniques.

Module IV: Spectroscopy (9 hrs)

Origin of spectra - Interaction of electromagnetic radiation with matter. Different types of energy levels in molecules: Rotational, vibrational and electronic levels. Statement of Born-Oppenheimer approximation - Fundamental laws of spectroscopy and selection rules (derivations not required). *IR Spectroscopy:* Introduction - Group frequency concept - Characteristic stretching frequencies of O-H, N-H, C-H, C=C, C=N and C=O functional groups - Fingerprint region in IR spectra. *UV-Visible Spectroscopy:* Introduction - Beer-Lambert's law - Electronic transitions in molecules ($\sigma\rightarrow\sigma^*$, $n\rightarrow\sigma^*$, $\pi\rightarrow\pi^*$ and $n\rightarrow\pi^*$) - Chromophore and auxochrome - Red shift and blue shift. *NMR Spectroscopy:* Introduction - Chemical shift and spin-spin coupling - Application in elucidating the structure of ethanol, dimethyl ether, propanal and acetone (detailed study not required).

Module V: Polymers (6 hrs)

Classification of polymers - Addition and condensation polymers – Thermoplastics and thermosetting plastics - Structure and applications of synthetic rubbers (Buna-S, Buna-N and neoprene), synthetic fibres(Nylon 66, Nylon 6 and dacron), thermoplastics (polyethene, polystyrene, PVC and teflon) and thermosetting plastics (bakelite and melmac). Uses of kevlar, nomex and lexan - Biodegradable polymers(PGA, PLA and PHBV) and their applications.

Module VI: Environmental Pollution (6 hrs)

Definition – Types of pollution.Air pollution: Pollution by oxides of nitrogen, carbon and sulphur. Effects of air pollution: Depletion ofozone, green house effect and acid rain.Water pollution: Pollution due to sewage, industrial effluents, soaps, detergents, pesticides, fertilizers and heavy metals – Eutrophication - Biological magnification and bioaccumulation - Effects of water pollution. Water quality parameters – DO, BOD and COD (elementary idea only). Soil pollution – Pollution due to plastics.Thermal pollution and radioactive pollution: Sources, effects and control measures.Solid Waste Management: Sanitary landfill and composting.

Module VII: Chemistry in Daily Life (12 hrs)

Petrochemicals: Name, carbon range and uses of fractions of petroleum distillation – Octane number–Cetane number – Flash point. LPG and CNG: Composition and uses. *Pharmaceuticals:* Drug - Chemical name, generic name and trade names with examples. Prodrug. Antipyretics, analgesics, antibiotics, antacids, antiseptics, antihistamines and tranquilizers (definition andexamples, structures not expected).

Dyes: Definition – Requirements of a dye - Theories of colour and chemical constitution - Structure andapplications of Martius yellow, indigo and alizarin.

Cleansing Agents: Soaps - Saponification of lipids – Hard and soft soaps. Detergents (classification andexamples) – Cleansing action - Advantages and disadvantages of soaps and detergents. Composition andhealth effects of tooth paste.

Cosmetics: Hair dye, Talcum powder, perfumes and deodorants (composition and health effects). *Food:* Food additives: Food preservatives, artificial sweeteners and antioxidants (definition and examples, structures not required) – Structure of BHT, BHA and Ajinomoto - Commonly used permittedand non-permitted food colours (structures not required) - Fast foods and junk foods & theirhealtheffects - Artificial ripening of fruits and its health effects. Importance of milk, coconut water and Neera.

Agriculture: Inorganic fertilizers: Essential nutrients for plants – Nitrogenous, phosphatic and potash fertilizers (examples only). Pesticides: Insecticides, herbicides, rodenticides and fungicides (definition and examples only) – Structure of Endosulphan, DDT and BHC - Harmful effects of pesticides. *Cement*: Manufacture, composition and setting.*Glass*: Manufacture – Annealing - Types of glasses and uses.

References

1. B.R. Puri, L.R. Sharma and M.S. Pathania, *Principles of Physical Chemistry*, 46th Edition, Vishal Publishing Company, New Delhi, 2013.
2. F. Daniels and R.A. Alberty, *Physical Chemistry*, 5th Edition, John Wiley and Sons, Canada, 1980.
3. P.S. Kalsi, *Applications of Spectroscopic Techniques in Organic Chemistry***,** 6th Edition New Age International (P) Ltd., New Delhi, 2004.
4. C.N. Banwell and E.M. McCash, *Fundamentals* of *Molecular Spectroscopy*, 4th Edition, McGraw–Hill publishing Company Limited, New Delhi, 2002.
5. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, *Fundamentals of Analytical Chemistry*, 8th Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.
6. A.I. Vogel, *A Textbook of Quantitative Inorganic Analysis*, 3 rd Edition, Longmans, Green, London, 1962.
7. A.K. De, *Environmental Chemistry*, 6th Edition, New Age International Pvt. Ltd., New Delhi, 2006.
8. A.K. Ahluwalia, *Environmental Chemistry*, Ane Books India, New Delhi, 2008.
9. V.R. Gowarikar, *Polymer Chemistry*, New Age International Pvt. Ltd., New Delhi, 2010.
10. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31 st Edition,

Milestone Publishers and Distributors, New Delhi, 2009.
11. Gurdeep R. Chatwal, *Synthetic Drugs*, Himalaya Publishing House, Bombay, 1995.
12. Jayashree Ghosh, *A Textbook of Pharmaceutical Chemistry*, 3 rd Edition, S. Chand and Company Ltd., New Delhi, 1999.
13. B. Srilakshmi, *Food Science*, 5th Edition, New Age Publishers Pvt. Ltd., New Delhi, 2010.

SJSDC4 FSC6	Forensic Physics, Ballistcics , Dermatoglyphics & Questioned Documents

Course No: 4.

Credits: 5
Hours: 75

Course Code: SJSDC4FSC6

Name of the Course: Forensic Physics, Ballistics, Dermatoglyphics & Questioned Documents

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate the scope of Forensic Physics	PO3/PSO2	E	F	11	-
CO2	Understand the destructive and non- destructive analytical method	PO3/PSO2	U	F/P	11	-
CO3	Understand the basic principles of Forensic Ballistics	PO3/PSO2	U	F	30	-
CO4	Familiarize the basics of dermatoglyphics	PO3/PSO2	U	F	20	-
CO5	To study the scope of questioned documents	PO3/PSO2	U	F	11	-
CO6	To study the scope of questioned documents	PO3/PSO2	U	F	11	-

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

SJSDC4 FSC6 –FORENSIC PHYSICS, BALLISTCICS, DERMATOGLYPHICS & QUESTIONED DOCUMENTS.

5 hrs/week 5 credits

SECTION I: FORENSIC PHYSICS

Module I: Glass, Paint & Fibre (10 hrs) Collection, packaging, analysis of glass evidence. Matching of glass samples by mechanical fit and refractive index measurements. Analysis by spectroscopic methods. Fracture analysis and direction of impact. Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases. Fibre evidence – artificial and man-made fibres. Collection of fibre evidence. Identification and comparison of fibres.

Module II: Soil & Cloth evidence (12 hrs) Importance, location, collection and comparison of soil samples. Cloth evidence – importance, collection, analysis of adhering material. Matching of pieces.

Module III: Tool marks (10 hrs) Classification of tool marks. Forensic importance of tool marks. Collection, preservation and matching of tool marks. Restoration of erased serial numbers and engraved marks. Forensic gemmology. Accident Analysis- Extent of vehicle damage, Estimation of speed, Tyre tread marks and skid marks, Trace evidence at accident sites, Hit and run investigations.

Recommended Reading:

1. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

2. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).

3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

SECTION 2: FORENSIC BALLISTICS

Module I: Firearms and ammunitions (18 hrs) Types of firearms and ammunition, Primer and priming compounds, Head stamp markings, Ballistics – internal, external and terminal. Mechanism of gun. Various kinds of firing marks- rifling marks, base markings, chamber marking, extraction and Ejection markings. Comparison microscope-instrumentation.

Module II: Firearm evidence (18 hrs) Collection and preservation of firearm evidence- firearm, ammunition, targets etc, Identification of bullets, wads collected from scene of crime. Matching of

bullets and cartridge cases, Gunshot residues-mechanism of formation, sample collection, analysis and instrumentation, Identification of shooter, Detection of range of firing- contact range, near contact, point blank, powder range, chip, Range, distant range, Determination of angle of impact, Ricochet analysis.

Module III: Identification and nature of firearm injuries (18 hrs) Identification and nature of firearm injuries, Shotgun, pistol, revolver, rifle, air guns. Bullet hole examinations-entry and exit hole determination, Estimation of calibre from bullet holes, Wave and cavitation effect, Bullet and trajectory through glass and other targets, Reconstruction with respect to accident, suicide and homicide.

Recommended Reading:

1. B.J. Heard, *Handbook of Firearms and Ballistics*, Wiley and Sons, Chichester (1997).

2. W.F. Rowe, Firearms identification, *Forensic Science Handbook*, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).

3. A.J. Schwoeble and D.L. Exline, *Current Methods in Forensic Gunshot Residue Analysis*, CRC Press, Boca Raton (2000).

4. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

5. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).

6. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013)

SECTION 3: FORENSIC DERMATOGLYPHICS AND QUESTIONED DOCUMENTS

Module I: Basics of Fingerprinting (20 hrs) Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints. Classification and cataloguing of fingerprint record. Automated Fingerprint Identification System. Significance of poroscopy and edgeoscopy. Development of Fingerprints-Latent prints. Constituents of sweat residue. Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents. Application of light sources in fingerprint detection. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Fingerprinting the deceased. Developing fingerprints on gloves. Importance of footprints. Casting of foot prints, Electrostatic lifting of latent foot prints. Palm prints. Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance. Palm prints and their historical importance.

Module III: Nature and Scope of Questioned Documents (22 hrs) Definition of questioned documents. Types of questioned documents. Preliminary examination of documents. Basic tools needed for forensic documents' examination – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, visible spectral comparator, electrostatic detection apparatus. Determining the age and relative age of documents. Comparison of Documents- Comparison of handwriting. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and individual characteristics. Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting. Standards for comparison of handwriting. Comparison of paper, ink, printed documents, typed documents, Xeroxed documents. Forgeries- Alterations in documents, including erasures, additions, over-writings and obliterations. Indented and invisible writings. Charred documents. Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Disguised writing and anonymous letters.

Recommended Reading:

1. J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton (1983).

2. D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton (2000).

3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton (2004).

4. Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3 rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

5. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton (1982).

6. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, Foundation Press, New York (1995).

7. R.N. Morris, *Forensic Handwriting Identification: Fundamental Concepts and Principles*, Academic Press, London (2000).

8. E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants (1997).

SJSDC4MB7	Medical Microbiology and Immunology

Course No: 4.4
Course Code: SJSDC4MB7
Course Name: Medical Microbiology and Immunology

Credits: 5
Hours: 75

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To analyse the various principles of Medical Microbiology	P03/PSO1	Z	F	12	-
CO2	To understand the diagnosis & prevention of bacterial diseases.	P03/PSO1	U	F	6	-
CO3	To understand the diagnosis & prevention of viral & fungal diseases	P03/PSO1	U	C, F	21	-
CO4	To understand the diagnosis & prevention of protozoan diseases	P03/PSO1	U	F, P	8	-
CO5	To analyse the principles of Immunoprophylaxis	PO1/PSO1	Z	F, C	14	-
CO6	To evaluate the principles of Immunology	PO1/PSO1	E	F	12	-
CO7	To evaluate the principles of hypersensitivity and autoimmune diseases	PO1/PSO1	E	F	6	-

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***F-factual, C-conceptual, P-practical/procedural**

SJSDC4MB7 MEDICAL MICROBIOLOGY AND IMMUNOLOGY

5hours/ week 5 credits

Unit 1- 12hrs. Infection and disease-definition. Types of infections – Primary, secondary, cross, endogenous, exogenous, nosocomial, congenital, teratogenic, iatrogenic, laboratory and latent. Various sources of Infection – human beings, animals, insects, soil, water and food. Carriers of infection – different types. Methods of transmission of infections – contact, inhalation, ingestion, inoculation and congenital. Definitions of MID, ID50, MLD, LD50, bacteremia, Septicemia, contageous epidemic, endemic, pandemic, sporadic and prosodesmic diseases. Epizootic and

enzootic. Factors influencing the virulence of pathogens Collection and transport of clinical specimens for microbiological examinations- Virulence factors of bacteria causing human infections- Normal flora of human body.

Unit 2-6 hours. Morphology, culture, biochemical, pathogenicity, laboratory diagnosis and prevention of bacterial diseases –Staphylococcus aureus, Mycobacterium tuberculosis, Clostridium tetani, Clostridium botulinum, Vibrio cholerae, Salmonella typhi.

Unit 3 -15 hrs
Viral diseases (with reference to symptoms, pathogenesis, transmission, prophylaxis and control) Polio, Chicken pox, Herpes, Hepatitis, Rabies, Influenza with brief description of bird and swine flu, Dengue, AIDS. An overview of emerging viral diseases: Japanese Encephalitis, SARS, Chikungunya.
Unit 4- 6hrs Fungal diseases – brief account on superficial, subcutaneous and deep mycoses (systemic). Laboratory diagnosis of fungal infections.
Unit 5- 8hrs Protozoan diseases – amoebiasis and malaria. Helminth infections – tapeworm, hook worm, round worm and filariasis. Flagellates – very brief account. Laboratory diagnosis of parasitic infections.
Unit 6- 6hrs Immunoprophylaxis – vaccines - history and development. Different types – live, killed, subUnit, toxoids, bacterial, viral etc. Different routes of administration – oral and parenteral – advantages and disadvantages (eg: BCG, OPV & IPV, DPT, MMR, TAB – brief account).
Unit 7- 8hrs Antibiotics: Classification of antibiotics, mode of actions, emergence and mechanism of resistance. Introduction to various generations of antibiotics.

Unit 8-6hrs.Types of immunity-innate and acquired, Hematopoiesis, Cells and organs of immune system, humoral and cell mediated immunity.

Unit 9- 6 hours. Antigens-types, epitopes, haptens, Basic structure of immunoglobulin, IgG, Polyclonal and monoclonal antibodies, clonal selection theory, Antigen – antibody reactions- agglutination and precipitation reactions, complement pathways, immunological tolerance in brief.

Unit 10-6 hours. Hypersensitivity and its types, autoimmune diseases- different types and its mechanisms.

Suggested Readings
1. Ananthanarayan R and Paniker CKJ. (2005). *Textbook of Microbiology*. 7th edition (edited by Paniker CKJ). University Press Publication.
2. Brooks GF, Carroll KC, Butel JS and Morse SA. (2007). *Jawetz, Melnick and Adelberg's Medical Microbiology*. 24th edition. McGraw Hill Publication.
3. Goering R, Dockrell H, Zuckerman M and Wakelin D. (2007). *Mims' Medical Microbiology*. 4th edition. Elsevier.
4. Joklik WK, Willett HP and Amos DB (1995). *Zinsser Microbiology*. 19th edition. AppletonCentuary-Crofts publication.
5. Willey JM, Sherwood LM, and Woolverton CJ. (2008). *Prescott, Harley and Klein's Microbiology*. 7th edition. McGraw Hill Higher Education. 6. Medical Microbiology : David Greenwood, Slack, Peutherer 7. Satish Gupte (2005). The Short Textbook of Medical

Microbiology.Eighth edition, Jaypee Brothers, Medical publishers (P) Ltd., New Delhi. 8. Baron EJ, Peterson LR and Finegold SM (1994). Bailey and Scotts diagnostic Microbiology. 9th edition, Mosby publications. 9. Rajan S (2009). Medical Microbiology. First edition, MJP Publishers, Chennai.
10. Abbas AK, Lichtman AH, Pillai S. (2007). *Cellular and Molecular Immunology*. 6th edition Saunders Publication, Philadelphia.
11. Delves P, Martin S, Burton D, Roitt IM. (2006). *Roitt's Essential Immunology*. 11 th edition Wiley-Blackwell Scientific Publication, Oxford.
12. Goldsby RA, Kindt TJ, Osborne BA. (2007). *Kuby's Immunology*. 6th edition W.H. Freeman and Company, New York.

SJSDC4CH5 (P)	Practical on Chemistry (1.3,2.3.3.3,4.3)

Course No: 4.6
Course Code: SJSDC4CH5 (P)

Course Name: Practical on Chemistry (1.3,2.3.3.3,4.3)
Credits: 4
Hours: 60

COURSE OUTLINE

Module I: Laboratory Safety, First Aid and Treatment of Fires
Importance of lab safety – Burns – Eye accidents – Cuts – Gas poisoning – Electric shocks – Treatment of fires – Precautions and preventive measures.
Module II: Volumetric Analysis
1. Weighing using chemical balance and electronic balance.
2. Preparation of standard solutions.
3. ***Neutralization Titrations***
(i) Strong acid – strong base.
(ii) Strong acid – weak base.
(iii) Weak acid – strong base.
4. ***Redox Ttrations***
Permanganometry:
(i) Estimation of oxalic acid.
(ii) Estimation of Fe2+/FeSO4.7H2O/Mohr's salt.
Dichrometry:
(i) Estimation of Fe2+/FeSO4.7H2O/Mohr's salt using internal indicator.
(ii) Estimation of Fe2+/FeSO4.7H2O/Mohr's salt using external indicator.
Iodimetry and Iodometry:
(i) Estimation of iodine.
(ii) Estimation of copper.
(iii) Estimation of chromium.

5. ***Complexometric Titrations***
(i) Estimation of zinc.
(ii) Estimation of magnesium.
(iii) Determination of hardness of water.

Module III: Gravimetric Analysis
1. Determination of water of hydration in crystalline barium chloride.
2. Estimation of Ba2+ as BaSO4.

Module IV: Inorganic Qualitative Analysis
(a) *Reactions of Cations:* Study of the reactions of the following cations with a view of their identification and confirmation.
Pb2+, Bi3+, Cu2+, Cd2+, Fe2+, Fe3+, Al3+, Ni2+, Co2+, Mn2+, Zn2+, Ba2+, Sr2+, Ca2+, Mg2+ and NH4+.
(b) Systematic qualitative analysis of a solution containing any two cations from the above list.

Module V: Determination of Physical Constants
1. Determination of boiling point.
2. Determination of melting point.

Module VI: Organic Preparations
1. *p*-Bromoacetanilide from acetanilide.
2. *p*-Nitroacetanilide from acetanilide.
3. Benzoic acid from benzaldehyde.
4. Benzoic acid from benzamide.

References
1. J. Mendham. R.C. Denney, J.D. Barnes and M. Thomas, *Vogel's Textbook of Quantitative Chemical Analysis*, 6th Edition, Pearson Education, Noida, 2013.
2. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, *Fundamentals of Analytical Chemistry*, 8th Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.
3. V.K. Ahluwalia, Sunita Dhingra and Adarsh Gulati, *College Practical Chemistry*, Universities Press (India) Pvt. Ltd., Hyderabad, 2008 (Reprint).
4. G. Svehla, *Vogel's Qualitative Inorganic Analysis*, 7th Edition, Prentice Hall, New Delhi, 1996.
5. V.V. Ramanujam, *Inorganic Semi Micro Qualitative Analysis*, 3 rd Edition, The National Publishing Company, Chennai, 1974.
6. W.G. Palmer, *Experimental Inorganic Chemistry*, Cambridge University Press, 1970.

SJSDC4MB/FSC (Pr2)	Mini Project

Course No: 4.7
Course Code: SJSDC2MB/FSC (Pr2)

Course Name: Mini Project
Credits: 4

Course Code: SJSDC2MB/FSC(Pr1)

Name of the Course: Mini Project

	Course Outcome	POs/ PSOs	CL	K C	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate and conduct internship and project in the field of forensic science or Microbiology	PO1/PSO4	E	P	-	20
CO2	Acquiring Independent research skills	PO1/PSO4	U	F/ C	-	20
CO3	Create and develop problem solving, critical thinking and decision making skills	PO1/PSO4	C	P/ F	-	20

COURSE OUTLINE

Mini Project on either Forensic Science or Applied Microbiology as per student's interest.

Semester V									
C.No	Course Code	Course Name	Credit	Marks			Hrs/week		
				Int	Ext	total	Th	Prac	Total
5.1	SJGEC5MB13	Molecular biology and Bioinformatics	4	20	80	100	4		4
5.2	SJGEC5MB14	Microbial Genetics & genetic engineering	4	20	80	100	4		4
5.3	SJSDC5 FSC7	Forensic Biology, Serology& Forensic Medicine	5	20	80	100	5		5
5.4	SJSDC5FSC8	Crime Investigation Techniques & techniques in personal identification	5	20	80	100	5		5
5.5	SJSDC5FSC9	Cyber crime & cyber forensics	4	20	80	100	4		4
5.6	SJSDC5MB8 (P)	Practical on Microbiology (4.5,5.2)	4	20	80	100		4	4
5.7	SJSDC5FSC10(P)	Practical on Forensic Science III (4.4, 5.3,5.4, 5.5)	4	20	80	100		4	4
		Semester V total	**30**			**700**	**22**	**8**	**30**

SJGEC5MB13	Molecular biology and Bioinformatics

Course No: 5.1
Course Code: SJGEC5MB13

Course Name: Molecular biology and Bioinformatics
Credits: 4
Hours: 60

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate the basic principles of Molecular Biology	PO1/PSO1	U, E	F, C	10	-
CO2	To evaluate the structural features of DNA & associated mutations	PO2/PSO1	E	F	10	-
CO3	Evaluate the principles of Central	PO2/P	E	F	12	-

	Dogma of Life	SO1				
CO4	Understand the basic principles of Bioinformatic tools	PO1/P SO1	U	C , P	20	-

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

***F-factual, C-conceptual, P-practical/procedural**

COURSE OUTLINE

SJGEC5MB13- **MOLECULAR BIOLOGY AND BIOINFORMATICS**

4 Hrs/Week 4 Credits

Unit 1-10hrs.**DNA:** DNA as the genetic material, Experimental proof. Structure of DNA and RNA, Types and forms – DNA, t-RNA, r-RNA, m-RNA - Definition and functions. Organization ofbacterial and eukaryotic chromosomes. Histones and their function. Denaturation and renaturation, cot curves. DNA topology - linking number, topoisomerases.

Unit 2-10hrs. **Replication of Prokaryotic and eukaryotic DNA**. Semiconservative replication of DNA. Models of replication- D-Loop, rolling circle and theta model. Mutation-introduction. General DNA repair mechanisms.

Unit 3-12 hrs. Transcription- prokaryotic and eukaryotic. Post transcriptional modifications. Translation- prokaryotes and eukaryotes, Genetic code. Post translational modifications. Brief account of gene regulation in prokaryotes – operon concept – lac and trp operon.
Unit 4-20 hrs. **Introduction to bioinformatics**: its importance and scope Biological data bases, primary and secondary sequence databases, Genbank, EMBL, DDBJ, PDB, MMDB, CATH, SCOP, VIDA and KEGG. Comparative genomics- Sequence alignment and analysis- BLAST, FASTA, CLUSTALW, MULTALIN. Application of bioinformatics- Drug designing and molecular docking, Homology modeling, Phylogenetics, Micro arrays. Structure visualization- Rasmol.

(A software assisted teaching method is preferred for demonstration of tools in bioinformatics and no practical examinations will be conducted.)

Suggested Readings

1. Text book of Biochemistry by Lehninger

2. Biochemistry by Stryer

3. Molecular Biology of the Gene by Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AAM, 1987. The Benjamin/Cummings publishing company.

4. Genes V by Lewin B, 1994. Oxford University press.

5. Molecular Cell Biology by Lodish, H, Baltimore D, Berk A, Zipursky SL, Matsudaira P, Darnell J., 1995. Scientific American Books.

6. Molecular Biology by Freifelder D., 1991 Narosa Publishing Home.

7. Principles of Gene Manipulation, 4th Ed., by R.S.Old and S.B.Primrose. 1989. Blackwell Scientific Publications, London

8. Introduction to Bioinformatics: T.K. Attwood, D.J. Parry-Smith and S. Phukan

9. Bioinformatics: Sequence and Genome analysis. David W. Mount

10. Bioinformatics: Genes, proteins and computers. C.A. Orengo, D.T. Jones and J.M. Thornton

11. Introduction to Bio informatics by Arthur. M Lesk

SJGEC5MB14	Microbial Genetics & genetic engineering

Course No: 5.2
Course Code: SJGEC5MB14
Course Name: Microbial Genetics & genetic engineering
Credits: 4 ,Hours: 60

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To understand the basic principles of genetics & mutations	PO2/PSO1	U	C	24	-
CO2	To analyse the basic concepts of gene transfer	PO1/PSO1	Z	C	22	-
CO3	To evaluate the basic steps of recombinant DNA technology	PO3/PSO1	E	F	10	-
CO4	To understand the basic principles of DNA analysis	PO1/PSO1	U	P	18	-

***R-remember, U-understand, A- apply, Z- analyze, E- evaluate, C- create**

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COURSE OUTLINE

SJGEC5MB14-**MICROBIAL GENETICS AND GENETIC ENGINEERING**

5Hrs/wk 5 Credits

Unit 1-12hrs. **Mendelian Genetics and its Extension**: Principles of Inheritance, Chromosome theory of inheritance, Laws of Probability, Pedigree analysis, Incomplete and co dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex linked inheritance. Extra chromosomal inheritance.

Unit 2-12 hrs.**Mutations**:Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy. Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations, Molecular basis of Mutations in relation to UV light and chemical mutagens, Detection of mutations-Ames test, Replica plating. Concept of Luria Delbrukii experiment.

Unit 3-12 hrs.**Linkage, Crossing Over gene transfer and Chromosomal Mapping:** Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence. Gene transfer techniques in prokaryotes and its utility in gene mapping- conjugation, transformation, transduction, interrupted mating techniques.
Unit 4-10 hrs Cell cycle and its regulation. Mitosis and meiosis. Check points and its significance. Programmed Cell death.

Unit 5 -10 hrs A concise account of methods used in "Recombinant DNA" technology – brief account of cell disruption techniques, vectors, gene transfer techniques, separation techniques and screening strategies.

Unit 6-8hrs DNA Sequencing. DNA Amplification- PCR, applications of PCR. DNA (Gene) libraries, application of genetic engineering technology- Gene therapy. GM foods, modified plant and animal varieties, terminator gene technology. Ethical problems associated with the use of r DNA technology.

Unit 7: Forensic DNA analysis (10 hrs) DNA –Evidentiary clue materials- collection of specimens, Extraction of sample for analysis, Polymerase Chain Reaction (PCR), Short Tandem Repeats (STR)-Role of fluorescent dyes, Restriction Fragment Length Polymorphism(RFLP), Touch DNA. Individuality determination – maternity and paternity issues. Role of DNA typing in identifying unrecognizable bodies. Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

Suggested Readings.

1. Molecular Biology of the Gene by Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AAM, 1987. The Benjamin/Cummings publishing company.

2. Genes V by Lewin B, 1994. Oxford University press.

3. Molecular Cell Biology by Lodish, H, Baltimore D, Berk A, Zipursky SL, Matsudaira P, Darnell J., 1995. Scientific American Books.

4. Molecular Biology by Freifelder D., 1991 Narosa Publishing Home.

5. Principles of Gene Manipulation, 4th Ed., by R.S.Old and S.B.Primrose. 1989. a. Blackwell Scientific Publications, London.

6. Biochemistry by Stryer L.,1995. W.H. Freeman and company.

7. Principles of Genetics by Gardner EJ, Simmons MJ, Snustad DP, 1991. John Wiley a. & Sons.

8. Genes and Genomes by Singer M, Berg P.,1991 University Science Books.
9. Alcamo IE. (2001). *DNA Technology: The Awesome Skill*. 2nd edition. Elsevier Academic Press, Brown TA. (2006). *Gene Cloning and DNA Analysis*. 5th edition. Blackwell Publishing, Oxford,
10. Clark DP and Pazdernik NJ. (2009). *Biotechnology-Applying the Genetic Revolution*. Elsevier Academic Press, USA.

11. Glick BR and Pasternak JJ. (2003). *Molecular Biotechnology*. 3rd edition. ASM Press Washington D.C.

12. Nigam A and Ayyagari A. (2007). *Lab Manual in Biochemistry, Immunology and Biotechnology*. Tata McGraw Hill, India.
13. Primrose SB and Twyman RM. (2006). *Principles of Gene Manipulation and Genomics*, 7thedition. Blackwell Publishing, Oxford, U.K.

14. Sambrook J, Fritsch EF and Maniatis T. (2001). *Molecular Cloning-A Laboratory Manual*.3rd edition. Cold Spring Harbor Laboratory Press.

15. Willey JM, Sherwood LM, and Woolverton CJ. (2008) *Prescott, Harley and Klein's Microbiology*. 7th edition. McGraw Hill Higher Education.

16. Text book of biochemistry by Satyanarayana 17. Text book of Biochemistry by DM. Vasudeven

17. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

18. D. Ubelaker and H. Scammell, *Bones*, M. Evans & Co., New York (2000).

19. S.Rhine, *Bone Voyage: A Journey in Forensic Anthropology*, University of Mexico Press, Mexico (1998). J.M. Butler, *Forensic DNA Typing*, Elsevier, Burlington (2005).

20. K. Inman and N. Rudin, *An Introduction to Forensic DNA Analysis*, CRC Press, Boca Raton (1997).

21. H. Coleman and E. Swenson, *DNA in the Courtroom: A Trial Watcher's Guide*, GeneLex Corporation, Washington (1994).

SJSDC5 FSC7	Forensic Biology, Serology& Medicine

Course No: 5.3
Course Code: SJSDC5 FSC7
Course Name: Forensic Biology, Serology& Medicine
Credits: 4
Hours: 60

Course Code: SJSDC5FSC7

Name of the Course: Forensic Biology, Serology & Medicine

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate significance of biological evidence in forensics	PO1/PSO2	E	F	22	-
CO2	Evaluate the significance of serological evidence in forensics	PO1/PSO2	E	F	22	-
CO3	Understand the insects of forensic importance	PO1/PSO2	U	F	10	-
CO4	Familiarize forensically important plants	PO1/PSO2	U	F	10	-
CO5	Evaluate significance of wildlife forensics	PO1/PSO2	E	F	10	-
CO6	Evaluate the fundamental aspects and scope of forensic medicine	PO1/PSO2	E	F	36	-

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***F-factual, C-conceptual, P-practical/procedural**

SJSDC5 FSC7- FORENSIC BIOLOGY, SEROLOGY & MEDICINE

5hours/week 5 credits

SECTION 1: FORENSIC BIOLOGY AND SEROLOGY

Module I: Biological evidence (22 hrs)

Hair- Significance, transfer and recovery, Structure of human hair, Morphology and biochemistry of human hair, Comparison of hair samples, Comparison of human and animal hairs. Semen- Forensic significance of semen, Composition and morphology of spermatozoa, Collection, evaluation and tests for identification of semen. Types and identification of microbial organisms of forensic significance, Diatoms and their forensic significance, Structure and analysis of skull and bones. Scope of forensic anthropology. Somatoscopy- observation of forehead, eye, nasal bridge, nasal tip, ear lobes, circumference of head, facial fractures etc. Somatometry- measurement of above features. Facial reconstruction- facial superimposition techniques and other techniques.

Module II: Serological evidence (22 hrs)

Composition of blood, Collection and preservation of blood evidence, Importance of dried blood stains, Antigens and antibodies, ABO blood groups, Determination of blood group from dried blood stains, Extracellular proteins and intracellular enzymes, Blood spatter analysis –basics, Composition and analysis of common body fluids like saliva, milk, sweat, urine, etc.

Module III: Forensic entomology (10 hrs)

Insects of forensic importance, Collection of entomological evidence during death investigations. General Entomology- significance of terrestrial and aquatic insects in forensic investigations and their role in crime detection, Insect's succession and its relationship to determine time since death. Impact of ecological factors on insect's developments.

Module IV: Forensic Botany (10 hrs)

Plant morphology, plant anatomy, Cell structure and functions. Basic plant tissues plant systematic, palynology, Plant architecture- roots, stems, flowers, leaves. Practical plant classification schemes. Various types of woods, timbers, seeds and leaves and their forensic importance. Identification and matching . Various types of Planktons and diatoms and their forensic importance. Study and identification of pollen grains, Identification of starch grains, powder and stains of spices etc. Paper and Paper Pulp identification. Types of poisonous plants. Types of plants yielding drugs of abuse.

Module V: Wildlife Forensics (10 hrs)

Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals. Birds flight and means of locomotion, Strikes and collisions,

Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts, Applications of Forensic Ornithology, Feather structure and topography.

Recommended Reading:

1. L. Stryer, *Biochemistry*, 3 rd Edition, W.H. Freeman and Company, New York (1988).

2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, *Harper's Biochemistry*, APPLETON & Lange, Norwalk (1993).

3. S. Chowdhuri, *Forensic Biology*, BPRD, New Delhi (1971).
4. R. Saferstein, *Forensic Science Handbook*, Vol. III, Prentice Hall, New Jersey (1993).

5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

SECTION II: FORENSIC MEDICINE
Module I: Death Investigations (12 hrs)

Fundamental aspects and scope of forensic medicine. Approaching the crime scene of death. Obtaining first hand information from the caller. Rendering medical assistance to the victim, if alive. Protecting life. Recording dying declaration. Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses. Suspect in custody – initial interrogation and searching for evidence. Miranda warning card. Assessing the crime scene. Request for forensic team. Importance of command post and log book. Management of crowd and media. Importance of taking notes. Items to be a part of noting. Documenting the death scene. Processing evidence. Evaluation of injuries. Indexing the death investigation. Handling buried body cases – search for buried bodies, methods of exhumation. Suicide cases – evaluating the type of injuries, gauging the psychological state of victim, suicide notes.

Module II: Autopsy (12 hrs)

Forensic pathology. Medico-legal aspects of death. Causes of death. Determination of time since death. Investigation of sexual offences. Death by drowning. Injuries. Types and classification of injuries. Antemortem and post mortem injuries. Aging of injuries. Artificial injuries.

Unit III: Forensic Odontology (12 hrs)

Development, scope and role of forensic odontology in mass disaster and anthropology. Types of teeth and their comparative anatomy. Bite marks. Forensic significance of bite marks. Collection, preservation and photography of bite marks evidence. Legal aspects of bite marks. Estimation of age from teeth.

Recommended Reading:

1. K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York (1982).

2. M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

3. J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).

4. H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science*, *Volume 1*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

5. V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).

6. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).

7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

8.Hosetti, B.B; *Concept in wildlife Management*, Daya Publishing House,(2005)

9. Linarce, Adrian; *Forensic science in wildlife investigation*, CRC Press, Taylor &

Francis,(2009)

10. Baalu, T.R.; *The wild life (protection) act, 1972*, Nataraj Publication,(2001)

11. Universal Publication; *Wild life (Protection act,1972)*, Universal

Publication,(2005)

12. K.Ramesh Rao & S.K. Purkayastha; *Indian woods*, FRI Press, (1972)

13. N. Clifford; *Timber Identification*, Leonard Hill ltd.,(1957)

14. Herbert L. Edlin; *A manual of wood identification*, Viking Press, (1976)

15. Herbert Stone; *The timbers of commerce*, International book distributors, (1985)

16. Erdtman, G; *Pollen morphology & Plant taxanomy: angiosperms (an introduction*

to palynology), Hafner Publishing Co., (1971)

17. Coyle, Heather Miller; *Forensic botany*, CRC Press, (2005)

18. Gangulee, Hirendra Chandra; *College botany*, New Central Book Agency, (1972).

SJSDC5FSC8	Crime Investigation Techniques & techniques in personal identification

Course No: 5.4

Credits: 5
Hours: 75

Course Code: SJSDC5FSC8

Name of the Course: Crime Investigation Technique & Techniques in Personal Identification

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Evaluate the various principles of crime investigation techniques	PO1/PSO2	E	F/C	18	-
CO2	To Evaluate various tools & techniques in crime investigation	PO1/PSO2	E	F/P	9	-
CO3	Understand the legal and ethical issues in forensic science	PO1/PSO2	U	F/C	9	-
CO4	Understand the crime scene reconstruction techniques	PO1/PSO2	U	F/C	18	-
CO5	Evaluate the various person identification techniques	PO1/PSO2	E	F/P	15	-

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SJSDC5FSC8- CRIME INVESTIGATION TECHNIQUES & TECHNIQUES IN PERSONAL IDENTIFICATION

5 hours/week 5 credits

SECTION I: CRIME INVESTIGATION TECHNIQUES

Module I: Crime Scene Management (18 hrs) Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes. Documentation of crime scenes – photography, videography, sketching and recording notes. Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at crime scenes. The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how?). Crime scene logs.

Module II: Crime Scene Evidence and report writing (18 hrs) Classification of crime scene evidence – physical and trace evidence. Locard principle. Collection, labelling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Report Writing and Evidence Evaluation- Components of reports and Report formants in respect of Crime Scene and Laboratory findings Court Testimonyadmissibility of expert testimony, pre Court preparations & Court appearance, Examination in chief, cross examination and re-examination, Ethics in Forensic Science.

Module III: Crime Scene Reconstruction (18 hrs) Introduction, Importance of crime scene reconstruction, nature of reconstruction. Basic principle of reconstruction (Recognition, Identification, Individualization, Reconstruction), Stages of reconstruction, Types of reconstruction-Classification, Pattern evidence reconstruction, Writing a reconstruction report, general recommendations. Final report for court presentation, case study.

Module IV: Biometrics (15 hrs) Definition, characteristics and operation of biometric system. Classification of biometric systems – physiological and behavioral. Strength and weakness of physiological and behavioral biometrics. Multimodal biometrics. Key biometric processes – enrolment, identification and verification. Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies. Physiological Biometrics- Fingerprints, palm prints, iris, retina, 36 geometry of hand and face. Behavioral Biometrics- Handwriting, signatures, keystrokes, gait and voice.

Recommended Reading:

1. M. Byrd, *Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence*, CRC Press, Boca Raton (2001).

2. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).

3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

4. S. Nanavati, M. Thieme and R. Nanavati, *Biometrics*, Wiley India Pvt. Ltd. (2002).

5. P. Reid, *Biometrics for Network Security*, New Delhi (2004).

6. J.R. Vacca, *Biometric Technologies and Verification Systems*, ButterworthHeinemann, Oxford (2007).

SJSDC5FSC9	Cyber crime & cyber forensics

Course No: 5.5
Credits: 4
Hours: 60

Course Code: SJSDC5FSC9

Name of the Course: Cyber Crime & Cyber Forensics

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Understand the fundamentals of computer hardware and software	PO1/PSO2	U	F	20	-
CO2	Evaluate differences between computer crimes and conventional crimes	PO1/PSO2	E	F/C	15	-
CO3	Evaluate the principles and techniques to prevent cybercrimes	PO1/PSO2	E	F	9	-
CO4	Analyse the legal and privacy issues in computer forensic investigations	PO1/PSO2	Z	F	10	-

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SJSDC5FSC9- CYBER CRIME & CYBER FORENSICS

Module I: Computer fundamentals (20 hrs) Fundamentals of computer hardware and accessories, development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats. Memory and processors – methods of storing data, Operating systems, Networks- LAN, WAN and MAN.

Module II: Cyber crimes (15 hrs) Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems. Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security in cyber space. An overview of hacking, spamming, phishing and stalking.

Module III: Computer Forensic Investigations (19 hrs) Seizure of suspected computer. Preparation required prior to seizure. Collection and seizure of magnetic data, Treatment of exhibits, Extraction of information, Restoration of deleted files –familiarization of software, Encase, Cyber check suites, Encryption and decryption methods**.** Protocol to be taken at the scene. Extraction of information from the hard disk. Treatment of exhibits. Creating bitstream of the original media. Collection and seizure of magnetic media. Legal and privacy issues. Examining forensically sterile media. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Tracking users.

Recommended Reading:

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, *Computer Crimes and Computer Forensics*, Select Publishers, New Delhi (2003).

2. C.B. Leshin, *Internet Investigations in Criminal Justice*, Prentice Hall, New Jersey (1997).

3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).

4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000)

SJSDC5MB8 (P)	Practical on Microbiology (4.5,5.2)

Course No: 5.6
Course Code: SJSDC5MB8(P)
Course Name: Practical on Microbiology (4.5,5.2)
Credits: 4
Hours: 60

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To understand the basis of cell biology	PO3/PSO3	U	P	-	20
CO2	To understand the concepts of molecular biology	PO3/PSO3	U	P	-	20
CO3	To evaluate the tests of medical microbiology	PO3/PSO3	E	P	-	10
CO4	To understand the forensic significance of human skeletal system	PO3/PSO3	U	P	-	10

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SJSDC5MB10(P)PRACTICAL RELATED TO MOLECULAR BIOLOGY& MEDICAL MICROBIOLOGY

4 Hrs/wk 4 CREDITS

1. Demonstration of mitosis and meiosis.

2. Extraction and estimation of DNA.

3. Extraction and estimation of RNA.

4. β-galactosidase induction.

5. Demonstration of polytene chromosomes.

6. Paper chromatography.

7. Electrophoresis.

8. Conjugation

9. Transformation

10. Agarose gel electrophoresis of DNA

11. Restriction digestion of DNA

12.AFB staining.

13. Biochemical reactions for identification of various groups of bacteria.

14. Identification of bacterial isolates from clinical samples.

15. Antibiotic sensitivity test.

16. Differential count of leukocytes.

17Lymphocyte isolation.

18. Blood grouping.

19. WIDAL agglutination test.

20. ASO latex agglutination test.

21. RA latex agglutination test.

22. RPR test.

23. To carry out extraction of DNA from body fluids.

24. To prepare a report on the role of DNA typing in solving paternity disputes.

25. To determine of age from skull and teeth.

2 6. To determine of sex from skull.

2 7. To determine sex from pelvis.

28. To study identification and description of bones and their measurements.

29. To investigate the differences between animal and human bones.

30. To perform somatometric measurements on living subjects.

31. To carry out craniometric measurements of human skull.

32. To estimate stature from long bone length.

SJSDC5FSC10(P)	Practical on Forensic Science III (4.4, 5.3,5.4, 5.5)

Course No: 5.7
Course Code: SJSDC5FSC10(P))
Course Name: Practical on Forensic Science III (4.4, 5.3,5.4, 5.5)

Credits: 4
Hours: 60

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	Study the destructive and non- destructive analytical method	PO1/PSO3	U	P	-	10
CO2	Examine the basics of dermatoglyphics and questioned documents	PO1/PSO3	A	P	-	10
CO3	Understand significance of forensic biology and serology	PO1/PSO3	U	P	-	10
CO4	Design protocols for crime scene investigation	PO1/PSO3	C	P	-	5
CO5	Evaluate advanced techniques in personal identification	PO1/PSO3	E	P	-	5
CO6	Evaluate crime investigation techniques	PO1/PSO3	E	P	-	10
CO7	Acquire knowledge in cyber forensics	PO1/PSO3	R	P	-	5
CO8	Create an awareness on computer forensics related softwares	PO1/PSO3	C	P	-	5

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SJSDC5FSC10(P)- PRACTICALS ON FORENSIC SCIENCE III (BASED ON COURSE NO 4.4, 5.3,5.4, 5.5)

SECTION I: FORENSIC PHYSICS & BALLISTICS

1. To compare soil samples by density gradient method.
2. To compare paint samples by physical matching method.
3. To compare paint samples by thin layer chromatography method.
4. To compare glass samples by refractive index method.
5. To identify and compare tool marks.
6. To compare cloth samples by physical matching.
7. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
8. To correlate the velocity of bullet with the impact it produces on the target.
9. To correlate the striking angle of the bullet with the impact on the target.
10. To estimate the range of fired bullets.
11. To carry out the comparison of fired bullets.
12. To carry out the comparison of fired cartridge cases.
13. To identify gunshot residue.
14. To correlate the nature of injuries with distance from which the bullet was fired.
15. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

SECTION II: FORENSIC DERMATOGLYPHICS AND QUESTIONED DOCUMENTS

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of foot prints.
10. To identify handwriting characters.

11. To study natural variations in handwriting.

12. To compare handwriting samples.

13. To detect simulated forgery.

14. To detect traced forgery.

15. To study the line quality defects in handwriting samples.

16. To examine the security features of currency notes, passports and plastic money.

17. To study alterations, obliterations and erasures in handwriting samples.

SECTION III: FORENSIC MEDICINE, FORENSIC BIOLOGY & SEROLOGY

1. To design a questionnaire for the first responder to the death scene.

2. To design a protocol to deal with the media at the crime scene.

3. To design a checklist for the forensic scientists at the death scene.

4. To analyze and preserve bite marks.

5. To examine hair morphology and determine the species to which the hair belongs.

6. To prepare slides of scale pattern of human hair.

7. To examine human hair for cortex and medulla.

8. To carry out microscopic examination of pollen grains.

9. To carry out microscopic examination of diatoms.

10. To cite a crime case in which diatoms have served as forensic evidence.

11. To prepare a case report on forensic entomology.

12. To determine blood group from fresh blood samples.

13. To determine blood group from dried blood sample.

14. To carry out the crystal test on a blood sample.

15. To identify blood samples by chemical tests.

16. To identify the given stain as saliva.

17. To identify the given stain as urine.

18. To carry out cross-over electrophoresis.

19. To study the correlation between impact angle and shape of bloodstain.

20. To identify the point of convergence from the bloodstain patterns.

SECTION III: ADVANCED TECHNIQUES IN PERSONAL IDENTIFICATION & CRIME INVESTIGATION TECHNIQUES

1. To protect and record scene of crime by different methods of barricading (indoor and outdoor).
2. To photograph scene of crime: Bird eye view, angular photography and close-up photography, evidential photography with and without light source.
3. To videograph scene of crime: Full scene videography, evidential videography.
4. Sketching of crime scene: Rough sketch of indoor/ outdoor crime scene, Final sketch of indoor/ outdoor crime scene.
5. Searching of evidence on scene of crime: Evidence search using traditional method of searching, evidence searching using light sources and modern technology, search of evidence in case of old crime scenes.
6. To prepare a report on evaluation of crime scene.
7. Collection of evidence at scene of crime (Physical, chemical, biological, document, fingerprint, ballistics, etc.,)
8. Preservation of evidences according to their nature, stability, reactivity.
9. Packing, sealing and forwarding of physical evidence to forensic science laboratory.
10. To reconstruct a crime scene (outdoor and indoor).

SECTION IV: CYBER CRIME & CYBER FORENSICS

1. To identify, seize and preserve digital evidence from crime scenes.

2. To detect deletions, obliterations and modifications of files using encase software.

3. To trace routes followed by e-mails and chats.

4. To identify the IP address of the sender of e-mails.

5. To demonstrate concealment techniques using cryptographic PGP.

6. To identify encrypted files.

7. To identify hidden files.

8. To use digital signatures for securing e-mail and online transactions.

9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.

10. To use symmetric and asymmetric keys for protection of digital record.

11. To carry out imaging of hard disks.

Semester VI								
Course Code	Course Name	Credit	Marks			Hrs/week		
			Int	Ext	total	Th	Prac	Total
SJSDC6MB/F	Internship and Project	30	0	10	100	0	30	30

SC (Pr)	(900hrs)			0				
	Semester VI total	**30**			**100**			**30**
	Grand Total	**180**			**3600**			**30**

Course No: 6.1
Course Code: SDC6MB/FSC (Pr)

Course Name: Internship and Project

Credits: 30
Hours: 900 Hours

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions (appr.)	Lab (Hrs)
CO1	To develop a research aptitude in students	PO3/PSO4	U,	P	-	200
CO2	To evaluate a scientific problem and find a solution to it	PO3/PSO4	E	P	-	200
CO3	To develop the skill of scientific writing	PO3/PSO4	A	P	-	200
CO4	To develop technical skills related to the industry	PO3/PSO4	A	P	-	300

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