

KHALSA COLLEGE AMRITSAR

-An Autonomous College

Affiliated to Guru Nanak Dev University, Amritsar.

Session: 2017-18

Syllabus : Bachelor of Food Science & Technology [Honours]

Post-Graduate Department of Food Science & Technology

ORDINANCE FOR BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.)

1. Eligibility for Admission and duration of the courses

(a) A Candidate who has passed Plus Two (Science) exam. of the Punjab School Education Board / C.B.S.E. / I.C.S.E. with 40% marks.

(b) Any other examination recognized as equivalent to the (a) above by the GNDU (with at least 40% marks in Science group) is eligible to join the course.

2. Scheme of Instructions-Examination

For each examination, every student admitted to the courses under the semester system must be on the rolls of the institution, and shall send his/her admission form and fees for the examination through the Principal/Head of the Institution, accompanied by the following certificates.

a) Of having attended at least 75% of the total number of lectures delivered in each theory and practical course separately. Deficiency in lectures may be condoned as per ordinances of college/University. If in particular semester, a student falls short of attendance in a maximum of two courses, he/she would be permitted to appear in the semester examination of the papers in which he/she fulfils the attendance requirements. The course/s in which the student does not fulfill the minimum attendance requirements, he/she shall not be permitted to appear in the semester examination of such course/s, and shall be declared as having failed in such course/s. A student who is falling short of attendance in maximum two courses, he/she shall be required to attend the minimum number of lectures which were falling short, during next year when the course/s is/are offered.

b) Of having good moral character.

c) The syllabi, courses of reading and regulations for the courses shall be notified by the university from time to time, and shall be deemed to constitute an integral part of ordinances. Course evaluation under the semester system of evaluation shall be done on marks basis. If a course has both the theory and practical components, the student will be required to pass both the components, separately. However, if the student fails in theory, but is passing in practical examination of that course, he/she will be required to clear the theory paper only, and vice-versa.

d) Carry on system for various semester examinations.

I. Courses having eight semester duration:

a. There shall be no condition for promoting a student from first semester to second semester.

b. A student shall be promoted to third semester only if he/she has passed at least 50% courses/papers of the first two semesters, but there will be no condition for promoting a student from third semester to fourth semester.

c. A student shall be promoted to fifth semester only if he/she has passed at least 50% courses/papers of the first four semesters.

d. There shall be no condition for promoting a student from fifth semester to sixth semester.

e. However, the student shall be promoted to sixth semester only if he/she has passed all the papers of the first semesters.

f. After a period of eight semesters, the student shall be given a period of two consecutive years to pass.

Note 1: No special chance or exemption shall be allowed beyond what is stated in the above Ordinances.

Note 2: Failing students shall appear in the examination in the regular semester examinations next year i.e. reappear of examination for an odd semester shall be conducted along with the next odd semester, and even semester along with the next even semester and there shall be no special supplementary examinations.

Note 3: If 50% of the courses/papers required to pass involve a fraction, the fraction of the course/paper will be treated as a full course. For example, if in a year there are 13 courses in two semesters, the candidate will be required to pass minimum of 7 courses/papers.

e) The pass marks for a course (paper) shall be 35% at Bachelor's Degree level. Pass marks in aggregate for all the courses shall be 40%. Re-evaluation shall be allowed as per ordinances.

If a candidate obtains less than 40% marks in aggregate at the end of final semester/year of his/her course but is pass in all individual papers, the result of such a candidate shall be declared as 'fail', and he/she shall be required to improve his/her score in one or more papers in any of the semesters/year so as to obtain a minimum of 40% marks in aggregate to pass the examination.

f) The medium of instructions shall be as already existing in the ordinances.

g) Grace marks will be allowed as per college/University ordinances.

h) Maximum time will be allowed to pass a course is given below

| | |
|-----------------|-----------------------------------|
| Course duration | Maximum time to complete a degree |
| Four years | Six years |

i) The candidate shall be treated to be failing in the course offered in the semester in which he has not sought admission/dropped the semester and such course/papers in which the candidate has failed shall be taken into account while deciding the promotion of the candidate in subsequent semesters as per the condition. The candidate shall be required to seek admission into the second semester examination as a regular candidate at the end of the prescribed duration of the course, but within the maximum time allowed to pass a course as given under Para (h) of the ordinances, provided that he fulfills all other requirements under the prevailing ordinances. Regular students admitted to a course shall register/enroll themselves with the university in the very first semester of their admission and pay prescribed fee to the college/University. Direct admission to second semester is not allowed.

3. Discipline

Each student shall be under the control and discipline of the concerned institution. In case of any misconduct on the part of a student, the institution shall have a power to take disciplinary action against the defaulter, to the extent of cancellation of admission of the defaulting student from the rolls of the institution.

4. Result-Division-Degree

The successful candidates shall be classified into the following divisions:

- First Division with distinction**-Those who obtain 75% or more marks at the end of their course.
- First Division**-Those who obtain 60% or more marks at the end of their course.
- Second Division**- Those who obtain 50% or more marks, but less than 60% marks at the end of their course.
- Third Division**- Those who obtain 40% or more marks, but less than 50% marks at the end of their course.

The successful candidate shall be awarded the degree in the subject of his/her study indicating the divisions obtained on the basis of the result of all the semester examinations. A student who does not complete the programme of study within the minimum duration of the course of his/her study, or fails in any course, shall not be eligible for any merit position/medal/award of the University.

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) SEMESTER I-VIII (2017-2018)

INDEX - I

| Sr No. | Code | Subject | Marks | | | | Page No. |
|---------------------|-----------|--|---------|--------------------|------------|-------|----------|
| | | | Theor y | Practical | Intern a l | Total | |
| SEMESTER-I | | | | | | | |
| 1 | FST - 101 | Communication Skills in English | 30 | Presentation 10 | 10 | 50 | 01 |
| 2 | FST - 102 | Punjabi Compulsory OR Basic Punjabi (<i>Mudhli</i> Punjabi) | 40 | - | 10 | 50 | 02 |
| 3 | FST - 103 | Crop Science | 30 | 18 | 12 | 60 | 03 |
| 4 | FST - 104 | Fundamentals of Food Nutrition | 40 | 24 | 16 | 80 | 04 |
| 5 | FST - 105 | Introductory Biochemistry | 40 | 24 | 16 | 80 | 05 |
| 6 | FST - 106 | Principles of Food Preservation | 40 | 24 | 16 | 80 | 06 |
| SEMESTER-II | | | | | | | |
| 7 | FST - 201 | Communication Skills in English | 30 | Presentation 10 | 10 | 50 | 07 |
| 8 | FST - 202 | Punjabi Compulsory OR Basic Punjabi (<i>Mudhli</i> Punjabi) | 40 | - | 10 | 50 | 08 |
| 9 | FST - 203 | Introduction to Computers | 30 | 18 | 12 | 60 | 09 |
| 10 | FST - 204 | General Microbiology | 40 | 24 | 16 | 80 | 10 |
| 11 | FST - 205 | Food Chemistry | 40 | 24 | 16 | 80 | 11 |
| 12 | FST - 206 | Food Additives | 40 | 24 | 16 | 80 | 12 |
| SEMESTER-III | | | | | | | |
| 13 | FST - 301 | Food Microbiology | 40 | 24 | 16 | 80 | 13 |
| 14 | FST - 302 | Fluid Milk Processing | 40 | 24 | 16 | 80 | 14 |
| 15 | FST - 303 | Processing of Meat and Meat Products | 40 | 24 | 16 | 80 | 15 |
| 16 | FST - 304 | Post Harvest Management of Fruits and Vegetables | 40 | 24 | 16 | 80 | 16 |
| 17 | FST - 305 | Cereal Milling and Legumes | 40 | 24 | 16 | 80 | 17 |
| 18 | ESL - 221 | Environmental Studies – I (Compulsory) | 40 | - | 10 | 50 | 18 |
| SEMESTER-IV | | | | | | | |
| 19 | FST - 401 | Processing of Milk Products – I | 40 | 24 | 16 | 80 | 19 |
| 20 | FST - 402 | Egg, Poultry and Fish Technology | 40 | 24 | 16 | 80 | 20 |
| 21 | FST - 403 | Fruits and Vegetables Processing | 40 | 24 | 16 | 80 | 21 |
| 22 | FST - 404 | Processing of Cereals and Legumes | 40 | 24 | 16 | 80 | 22 |
| 23 | FST - 405 | Food Plant Hygiene and Sanitation | 40 | 24 | 16 | 80 | 23 |
| 24 | ESL - 222 | Environmental Studies – II (Compulsory) | 40 | - | 10 | 50 | 24 |
| SEMESTER-V | | | | | | | |
| 25 | FST - 501 | Principles of Fermentation Technology | 40 | 24 | 16 | 80 | 25 |
| 26 | FST - 502 | Food Packaging - I | 40 | 24 | 16 | 80 | 26 |
| 27 | FST - 503 | Confectionery & Sugar Technology | 40 | 24 | 16 | 80 | 27 |
| 28 | FST - 504 | Oil & Fat Technology-I | 40 | 24 | 16 | 80 | 28 |
| 29 | FST - 505 | Processing of Milk Products - II | 40 | 24 | 16 | 80 | 29 |

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| Sr No. | Code | Subject | Marks | | | | Page No. |
|----------------------|-----------|---------------------------------|--------|-----------|----------|-------|----------|
| | | | Theory | Practical | Internal | Total | |
| SEMESTER-VI | | | | | | | |
| 30 | FST - 601 | Quality Assurance | 40 | 24 | 16 | 80 | 30 |
| 31 | FST - 602 | Grain Storage | 40 | 24 | 16 | 80 | 31 |
| 32 | FST - 603 | Food Packaging - II | 40 | 24 | 16 | 80 | 32 |
| 33 | FST - 604 | Spices & Flavor Technology | 40 | 24 | 16 | 80 | 33 |
| 34 | FST - 605 | Technology of Fermented Foods | 40 | 24 | 16 | 80 | 34 |
| 35 | FST - 606 | In Plant Training 4 Weeks | - | - | - | S/US | 35 |
| SEMESTER-VII | | | | | | | |
| 36 | FST - 701 | Food Safety & Food Laws | 40 | 24 | 16 | 80 | 36 |
| 37 | FST - 702 | Industrial Microbiology | 40 | 24 | 16 | 80 | 37 |
| 38 | FST - 703 | Oil & Fat Technology - II | 40 | 24 | 16 | 80 | 38 |
| 39 | FST - 704 | Food Engineering – I | 40 | 24 | 16 | 80 | 39 |
| 40 | FST - 705 | Malting & Brewing Technology | 40 | 24 | 16 | 80 | 40 |
| SEMESTER-VIII | | | | | | | |
| 41 | FST - 801 | Food Biotechnology | 40 | 24 | 16 | 80 | 41 |
| 42 | FST - 802 | Enzymes In Food Processing | 40 | 24 | 16 | 80 | 42 |
| 43 | FST - 803 | Food Engineering - II | 40 | 24 | 16 | 80 | 43 |
| 44 | FST - 804 | Food Plant Layout | 40 | 24 | 16 | 80 | 44 |
| 45 | FST - 805 | Food Analysis & Instrumentation | 40 | 24 | 16 | 80 | 45 |

Note:

1. Marks of ESL-221 & ESL-222 are not included in the total marks.
2. All the students are required to undergo 'In Plant Training' for 4 weeks in a food processing unit after 6th semester's final examinations. Final degree to the students will be awarded subject to their successfully completing the 'In Plant Training'.
3. In Plant Training will be evaluated as satisfactory / unsatisfactory internally by the department of the college concerned.
4. Last date for submission of training Report within 1 Week after coming from training.

Ist Semester:

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|---|------------------|-----------|--------|--------------------|------|----------|
| | | Theory | Practical | Theory | Practical | Int. | |
| FST – 101 | Communication Skills in English | 4 | - | 30 | Presentation 10 | 10 | 50 |
| FST – 102 | Punjabi Compulsory OR Basic Punjabi (<i>Mudhli</i> Punjabi) | 4 | - | 40 | - | 10 | 50 50 |
| FST – 103 | Crop Science | 3 | 3 | 30 | 18 | 12 | 60 |
| FST – 104 | Fundamentals of Food Nutrition | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 105 | Introductory Biochemistry | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 106 | Principles of Food Preservation | 3 | 3 | 40 | 24 | 16 | 80 |

IInd Semester:

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|--|------------------|-----------|--------|--------------------|------|----------|
| | | Theory | Practical | Theory | Practical | Int. | |
| FST – 201 | Communication Skill in English | 4 | - | 30 | Presentation 10 | 10 | 50 |
| FST – 202 | Punjabi Compulsory OR Basic Punjabi (<i>Mudhli</i> Punjabi) | 4 | - | 40 | - | 10 | 50 50 |
| FST – 203 | Introduction to Computers | 3 | 3 | 30 | 18 | 12 | 60 |
| FST – 204 | General Microbiology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 205 | Food Chemistry | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 206 | Food Additives | 3 | 3 | 40 | 24 | 16 | 80 |

IIIrd Semester:

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|--|------------------|-----------|--------|-----------|------|-------|
| | | Theory | Practical | Theory | Practical | Int. | |
| FST – 301 | Food Microbiology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 302 | Fluid Milk Processing | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 303 | Processing of Meat and Meat Products | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 304 | Post Harvest Management of Fruits and Vegetables | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 305 | Cereal Milling and Legumes | 3 | 3 | 40 | 24 | 16 | 80 |
| ESL – 221* | Environmental Studies – I (Compulsory) | 1.5 | - | 50 | - | | 50 |

IVth Semester:

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|---|------------------|-----------|--------|-----------|------|-------|
| | | Theory | Practical | Theory | Practical | Int. | |
| FST – 401 | Processing of Milk Products-I | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 402 | Egg, Poultry and Fish Technology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 403 | Fruits and Vegetables Processing | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 404 | Processing of Cereals and Legumes | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 405 | Food Plant Hygiene and Sanitation | 3 | 3 | 40 | 24 | 16 | 80 |
| ESL – 222* | Environmental Studies – II (Compulsory) | 1.5 | - | 50 | - | | 50 |

***Note:** Marks of ESL-221 & ESL-222 are not included in the Total Marks.

Vth Semester:

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|---------------------------------------|------------------|-----------|--------|-----------|------|-------|
| | | Theory | Practical | Theory | Practical | Int. | |
| FST – 501 | Principles of Fermentation Technology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 502 | Food Packaging-I | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 503 | Confectionery & Sugar Technology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 504 | Oil & Fat Technology - I | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 505 | Processing of Milk Products-II | 3 | 3 | 40 | 24 | 16 | 80 |

VIth Semester :

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|-------------------------------|------------------|-----------|--------|-----------|------|-------|
| | | Theory | Practical | Theory | Practical | Int. | |
| FST – 601 | Quality Assurance | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 602 | Grain Storage | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 603 | Food Packaging-II | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 604 | Spices & Flavour Technology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 605 | Technology of Fermented Foods | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 606 | In Plant Training 4 weeks | - | - | - | - | | S/US |

Last date for submission of Training Report: within 1 week after coming from training.

Note: All the students are required to undergo 'In Plant Training' for 4 weeks in a food processing unit after VIth semester's final examinations. Final degree to the students will be awarded subject to their successfully completing the 'In Plant Training'. In Plant Training will be evaluated as satisfactory / unsatisfactory internally by the department of the college concerned.

VIIth Semester

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|------------------------------|------------------|-----------|-------|------|------|-------|
| | | Theory | Practical | Th. | Prt. | Int. | |
| FST – 701 | Food Safety & Food Laws | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 702 | Industrial Microbiology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 703 | Oil & Fat Technology – II | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 704 | Food Engineering – I | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 705 | Malting & Brewing Technology | 3 | 3 | 40 | 24 | 16 | 80 |

VIIIth Semester

Teaching Periods/Marks

| Course code | Course title | Teaching Periods | | Marks | | | Total |
|-------------|---------------------------------|------------------|-----------|-------|------|------|-------|
| | | Theory | Practical | Th. | Prt. | Int. | |
| FST – 801 | Food Biotechnology | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 802 | Enzymes in Food Processing | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 803 | Food Engineering – II | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 804 | Food Plant Layout | 3 | 3 | 40 | 24 | 16 | 80 |
| FST – 805 | Food Analysis & Instrumentation | 3 | 3 | 40 | 24 | 16 | 80 |

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER – I

(FST-101 COMMUNICATION SKILLS IN ENGLISH)

Time: 3 Hours

Max. Marks: 50
Theory Marks: 40
Internal assessment: 10
Lectures /week: 6

Course Contents:

1. Reading Skills: Reading Tactics and strategies; Reading purposes—kinds of purposes and associated comprehension; Reading for direct meanings; Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/ expressions. Skimming. scanning

Activities:

- Active reading of passages on general topics
- Reading newspaper. Articles, editorials etc.
- Short comprehension questions based on content and development of ideas

2. Writing Skills: Guidelines for effective writing; writing styles for application, resume, personal letter, official/ business letter, memo, notices etc.; outline and revision.

Activities:

- Formatting personal and business letters.
- Organizing the details in a sequential order
- Converting a biographical note into a sequenced resume
- Ordering and sub-dividing the contents while making notes.
- Writing notices for circulation/ boards
- Writing newspaper reports based on given heading

Suggested Pattern of Question Paper:

The question paper will consist of eight skill-oriented questions from Reading and Writing Skills. Each question will carry 5 marks. The questions shall be phrased in a manner that students know clearly what is expected of them. There will be internal choice wherever possible.

- Comprehension questions of an unseen passage.
- Personal letter
- Official/Business correspondence
- Writing technical report
- Writing notices/agenda/resolution/ minutes for public circulation on topics of professional interest
- **Writing resume or converting a biographical note into resume**
- **Writing news report based on a given heading**
- Do as directed (5x1=5 marks) (articles, tenses, pronouns, prepositions, conjunctions, forms of verbs) (8 x5 =40)

Recommended Books:

- Oxford Guide to Effective Writing and Speaking by John Seely.
- The Written Word by Vandana R Singh, Oxford University Press
- Murphy's English Grammar (*by Raymond Murphy*) CUP

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER – I

(FST-102 ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ)

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 40
ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ : 10
ਕੁਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. **ਦੋ ਰੰਗ** (ਕਵਿਤਾ ਭਾਗ) (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ ਅਤੇ ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ), ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
2. **ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ** (ਬਲਵੰਤ ਗਾਰਗੀ), ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
ਲੇਖ : ਕੇ. ਐਲ.ਸਹਿਗਲ, ਬੜੇ ਗੁਲਾਮ ਅਲੀ ਖਾਂ, ਸੋਭਾ ਸਿੰਘ, ਪ੍ਰਿਥਵੀਰਾਜ ਕਪੂਰ, ਭਾਈ ਸਮੁੰਦ ਸਿੰਘ।
3. **ਪੈਰੂਾ ਰਚਨਾ**
4. **ਪੈਰੂਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ।**
5. (ੳ) **ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ** : ਉਚਾਰਨ ਅੰਗ, ਉਚਾਰਨ ਸਥਾਨ ਤੇ ਵਿਧੀਆਂ, ਸਵਰ, ਵਿਅੰਜਨ, ਸੁਰ।
(ਅ) **ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ** : ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਦਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।
6. **ਮਾਤ ਭਾਸ਼ਾ ਦਾ ਅਧਿਆਪਨ**
(ੳ) ਪਹਿਲੀ ਭਾਸ਼ਾ ਦੇ ਤੌਰ ਉੱਤੇ
(ਅ) ਦੂਜੀ ਭਾਸ਼ਾ ਦੇ ਤੌਰ ਉੱਤੇ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

- | | |
|---|-------|
| 1. ਕਿਸੇ ਕਵਿਤਾ ਦਾ ਸਾਰ ਜਾਂ ਉਸਦਾ ਵਿਸ਼ਾ ਵਸਤੂ (ਦੋ ਵਿਚੋਂ ਇਕ) | 8 ਅੰਕ |
| 2. ਰੇਖਾ ਚਿਤਰ : ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਸ਼ਖਸੀਅਤ ਦੇ ਗੁਣ | 8 ਅੰਕ |
| 3. ਪੈਰੂਾ ਰਚਨਾ : ਤਿੰਨ ਵਿਸ਼ਿਆਂ ਵਿਚੋਂ ਕਿਸੇ ਇਕ ਉੱਤੇ ਪੈਰੂਾ ਲਿਖਣ ਲਈ ਕਿਹਾ ਜਾਵੇ । | 4 ਅੰਕ |
| 4. ਪੈਰੂਾ ਦੇ ਕੇ ਉਸ ਬਾਰੇ ਪੰਜ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ | 4 ਅੰਕ |
| 5. ਨੰਬਰ ੫ ਉੱਤੇ ਦਿੱਤੀ ਵਿਆਕਰਣ ਦੇ ਆਧਾਰ ...ਤੇ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ | 8 ਅੰਕ |
| 6. ਨੰਬਰ 6 ਵਿਚ ਮਾਤ ਭਾਸ਼ਾ ਦੇ ਪਹਿਲੀ ਭਾਸ਼ਾ ਅਤੇ ਦੂਜੀ ਭਾਸ਼ਾ ਵਜੋਂ ਅਧਿਆਪਨ, ਮਹੱਤਵ ਅਤੇ ਸਮੱਸਿਆਵਾਂ ਬਾਰੇ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਵਿਦਿਆਰਥੀ ਨੇ ਦੋ ਦਾ ਉੱਤਰ ਦੇਣਾ ਹੋਵੇਗਾ। (4×2)=8 ਅੰਕ | 8 ਅੰਕ |

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ ੧੦ ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 40+10 = 50 ਹਨ।

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -I

(FST-102 ਮੁੱਢਲੀ ਪੰਜਾਬੀ)

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 40
ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ : 10
ਕੁਲ ਅੰਕ : 50

1. **ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ**
ੳ) ਨਾਮਕਰਣ ਤੇ ਸੰਖੇਪ ਜਾਣ ਪਛਾਣ : ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਅੱਖਰ ਕ੍ਰਮ, ਸਵਰ ਵਾਹਕ (ੳ ਅ ਏ), ਲਗਾਂ ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ।
ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ 15 ਅੰਕ
2. **ਗੁਰਮੁਖੀ, ਆਰਥੋਗ੍ਰਾਫੀ ਅਤੇ ਉਚਾਰਨ** : ਸਵਰ, ਵਿਅੰਜਨ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ ਅਤੇ ਉਚਾਰਣ, ਮੁਹਾਰਨੀ, ਲਗਾਂ ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ । 10 ਅੰਕ
3. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਜੋੜ** : ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਤਿੰਨ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ), ਸਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਬਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਔਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲੈਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਲਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲਾਵਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਹੋੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਕਨੌੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਲਗਾਂਖਰ (ਟਿੱਪੀ, ਬਿੰਦੀ, ਅੱਧਕ) ਵਾਲੇ ਸ਼ਬਦ, ਸੁੱਧ-ਅਸੁੱਧ। 15 ਅੰਕ

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੈ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। (5+5+5) 15 ਅੰਕ
2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਨੰਬਰ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। 10 ਅੰਕ
3. ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। 15 ਅੰਕ

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –I

(FST-103 CROP SCIENCE)

Time: 3 Hours

Max. Marks: 60
Theory Marks: 30
Practical Marks: 18
Internal Marks: 12

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Classification of crops, Study of the following crops with particular reference to climatic and soil requirements, their improved cultural practices with special emphasis on seed bed preparation, improved varieties, rotations, seed and seed treatment, sowing, manures and fertilizers, irrigation requirements, weed control, harvesting and marketing.

Cereal crops : Paddy, Maize, Wheat

Pluses : Green gram, Black gram, Bengal gram and Soyabean.

UNIT-II

Oilseeds : Groundnut, Sunflower and Mustard.

Vegetables : Egg plant (Brinjal), Tomato, Ladyfinger, Peas, Cauliflower, Cabbage, Carrot, Potato.

UNIT-III

Horticultural Crops : Study of fruits with special emphasis on selection of site and soil, their cultural practices with particular reference to training, pruning, propagation methods, harvesting and fruit handling of Mango, Papaya and Kinnow.

Practicals:

Identification of crops, vegetables and fruits studied. Identification and composition of fertilizers and computation of doses of different fertilizers for different crops. Identification and collection of weeds associated with crops studied.

Recommended Books:

1. Package of practices for cultivation of fruits and vegetables.
2. Package of practices for crops of Punjab :Rabi and Kharif.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –I

(FST-104 FUNDAMENTALS OF FOOD NUTRITION)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT I

Definition, Scope & History of Nutrition.

Functions of Food, Food types and groups, Water Balance & Energy Balance.

Energy value of Carbohydrates, Fats & Proteins.

BMI & BMR of an individual.

Balanced diet, Protein and carbohydrate malnutrition.

UNIT II

Recommended daily allowances and requirement of infants, children, adults, old people, Athletes, Expectant and nursing mothers.

Diet surveys& Diet groups, Food Exchange List.

UNIT III

Importance of therapeutic nutrition, Deficiency diseases and disorders of metabolism.

Planning of diets for patients suffering from Ulcer, Anemia, Diarrhea, Diabetes, and Cardiac diseases, Jaundice, Nephritis and Tuberculosis.

Practicals:

1. Identification of food sources for various nutrients.
2. Instruction to diet planning using food exchange list.
3. Calculation of BMI & BMR.
4. Evaluation of own diet.
5. Planning of diet for children, adult and old people.
6. Planning of diet for patient suffering from Ulcer, Anemia, Diabetes, Diarrhea and Cardiac diseases.

Recommended Book:

Food Nutrition: M. Swami Nathan Vol. I, II.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –I**(FST-105 INTRODUCTORY BIOCHEMISTRY)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:****Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.****Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.****Theory:****UNIT I**

General introduction and importance of Biochemistry. Different nutrients of food.

Carbohydrates - Introduction, sources, classification, structure and biochemical functions, metabolic pathways (glycolysis, TCA and HMP) of carbohydrates, Lactic acid and alcoholic fermentation.

Proteins - Introduction, classification, sources, structural organization and biochemical functions, amino acids and their importance.

UNIT II

Lipids - Introduction, classification, sources, structure and biochemical functions, a brief introduction to fatty acids, oxidation of fatty acids.

Vitamins - Introduction, sources and biochemical functions, daily requirements & deficiency diseases of fat and water soluble vitamins.

UNIT III

Minerals - Introduction, classification as major and minor elements, sources, biochemical functions, daily requirements & deficiency diseases of Ca, Fe, I, P, Na, K, F & Zn.

Digestion and Absorption of carbohydrates, proteins and lipids.

Practicals:

1. Preparation of standard solutions of acid and alkali.
2. Determination of pH using indicators and with pH meter.
3. Determination of moisture in a given sample.
4. Determination of ash in a given sample.
5. Determination of acidity in a given sample.
6. Estimation of fat by soxhlet method.
7. Estimation of free fatty acid of given sample.
8. Determination of total solids in the given food product.
9. Determination of crude fiber in the given food.

Books Recommended:

1. Principles of Biochemistry by Lehinger AL, 1995, CBS Publisher, New Delhi.
2. Text Book of Biochemistry by Rama Rao AVSS, 1999, LK and S Publishers, Visakhapatnam, Indian.
3. Laboratory Manual in Biochemistry by Jay Raman J, 1996, New Age International Ltd. New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –I

(FST-106 PRINCIPLES OF FOOD PRESERVATION)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Introduction: Historical developments of food preservation. Principles of Food preservation. Scope and benefit of food preservation. Causes of food spoilage.

Preservation by Heat: Heat resistance of microorganisms and their spores. Thermal death time, Heat treatments – boiling, steam under pressure, pasteurization, canning, Aseptic processing.

Preservation by Low Temperature: Low temperature storage, refrigeration and freezing.

UNIT-II

Preservation by Drying: Methods of drying – dehydration by Air drying, sun drying and freeze Drying.

Preservation by Concentration Methods, Intermediate moisture foods.

UNIT-III

Microwave Heating: Properties, mechanism, microwave generator and microwave food application.

Preservation by Radiations: Ultraviolet and ionizing irradiations. Their effect on microorganisms, use in the treatment of food.

Practicals:

1. Adequacy of blanching.
2. Dehydration of foods.
3. Preservation of food products by low temperature.
4. Preservation of food products by concentration method.
5. Use of chemicals in preservation of foods.
6. Cut out examination of canned foods.
7. Visit to food industry.

Books Recommended:

1. Food Microbiology by Frazier WC and West Hoff DC, 1988, Tata McGraw Hill Publishers, New Delhi.
2. Food Science by Potter NN, 2006, CBS Publishers, New Delhi.
3. The Technology of Food Preservation by Desrosier & Desrosoier.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –II

(FST-201 COMMUNICATION SKILLS IN ENGLISH)

Time: 3 Hours

Max. Marks: 50

Theory Marks: 40

Internal assessment: 10

Lectures /week: 6

Course Contents:

- **Listening Skills:** Barriers to listening; effective listening skills; feedback skills. Attending telephone calls; note taking.

Activities:

- Listening exercises – Listening to conversation, press note
- Taking notes on a speech/lecture
- **Speaking and Conversational Skills:** Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics. The study of sounds of English, stress and intonation Situation based Conversation in English Essentials of Spoken English

Activities:

- Making conversation and taking turns
- b) Oral description or explanation of a common object, situation or concept
- c) Giving interviews

Suggested Pattern of Question Paper:

The question paper will consist of eight skill-oriented questions from listening and speaking Skills. Each question will carry 5 marks. The questions shall be phrased in a manner that students know clearly what is expected of them. There will be internal choice wherever possible.

- Making summary/ précis or paraphrasing of an idea of a given passage.
- Writing a paragraph of expository or argumentative nature of a given topic.
- Interpretation of a given data, chart, diagram etc and making a brief report.
- Transcoding (given dialogue to a prose or given prose to dialogue).
- Making given number of slides for a presentation on a given topic.
- **Write a press note on college activities.**
- **Write an email or a reply to an email**
- Do as directed (5x1=5 marks) (change of voice, narration, combination of 2 simple sentences into one, subject-verb agreement, using appropriate tense, forms of verbs. (8X5 = 40)

Recommended Books:

- Oxford Guide to Effective Writing and Speaking by John Seely.
- The Written Word by Vandana R Singh, Oxford University Press
- Murphy's English Grammar (by Raymond Murphy) CUP

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –II

(FST-202 ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ)

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 40
ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ : 10
ਕੁਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. ਦੋ ਰੰਗ (ਕਹਾਣੀ ਭਾਗ) (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ ਅਤੇ ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ), ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
2. ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ (ਬਲਵੰਤ ਗਾਰਗੀ), ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
ਲੇਖ : ਸਤੀਸ਼ ਗੁਜਰਾਲ, ਗੁਰਚਰਨ ਸਿੰਘ, ਠਾਕੁਰ ਸਿੰਘ, ਬਲਰਾਜ ਸਾਹਨੀ, ਸੁਰਿੰਦਰ ਕੌਰ।
3. ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ : ਪਰਿਭਾਸ਼ਾ, ਮੁਢਲੇ ਸੰਕਲਪ।
4. ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ
5. ਪੈਰ੍ਹਾ ਰਚਨਾ
6. ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ
7. ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਕਿਸੇ ਕਹਾਣੀ ਦਾ ਸਾਰ ਜਾਂ ਉਸਦਾ ਵਿਸ਼ਾ ਵਸਤੂ (ਦੋ ਵਿਚੋਂ ਇਕ) (8 ਅੰਕ)
2. ਰੇਖਾ ਚਿਤਰ : ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਸ਼ਖਸੀਅਤ ਦੇ ਗੁਣ (8 ਅੰਕ)
- 3-4. 3-4 ਨੰਬਰ ਉੱਤੇ ਦਿੱਤੀ ਵਿਆਕਰਣ ਦੇ ਆਧਾਰ ਤੇ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ (8 ਅੰਕ)
5. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਤਿੰਨ ਵਿਸ਼ਿਆਂ ਵਿਚੋਂ ਕਿਸੇ ਇਕ ਉੱਤੇ ਪੈਰ੍ਹਾ ਲਿਖਣ ਲਈ ਕਿਹਾ ਜਾਵੇ। (4 ਅੰਕ)
6. ਪੈਰ੍ਹਾ ਦੇ ਕੇ ਉਸ ਬਾਰੇ ਚਾਰ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ (4 ਅੰਕ)
7. ਨੰਬਰ ੭ ਵਿਚ ਅੱਠ ਅਖਾਣ ਅਤੇ ਅੱਠ ਮੁਹਾਵਰੇ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਵਿਦਿਆਰਥੀ ਨੇ ਚਾਰ-ਚਾਰ ਨੂੰ ਵਾਕਾਂ ਵਿਚ ਵਰਤ ਕੇ ਅਰਥ ਸਪੱਸ਼ਟ ਕਰਨੇ ਹੋਣਗੇ। (4+4 = 8 ਅੰਕ)

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ ੧੦ ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 40+10 = 50 ਹਨ।

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER –II

(FST-202 ਮੁੱਢਲੀ ਪੰਜਾਬੀ)

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 40
ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ : 10
ਕੁਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ** : ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀ ਕੋਸ਼ਗਤ ਸ਼ਬਦ ਅਤੇ ਵਿਆਕਰਣਿਕ ਸ਼ਬਦ **15 ਅੰਕ**
2. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਪ੍ਰਕਾਰ** :
ੳ) ਸੰਯੁਕਤ ਸ਼ਬਦ, ਸਮਾਸੀ ਸ਼ਬਦ, ਦੋਜਾਤੀ ਸ਼ਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀ ਸ਼ਬਦ ਅਤੇ ਮਿਸ਼ਰਤ ਸ਼ਬਦ
ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ **10 ਅੰਕ**
3. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ** :
ੳ) ਇਕ-ਵਚਨ ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁਆਰਥਕ ਸ਼ਬਦ, ਸਮਾਨਅਰਥਕ ਸ਼ਬਦ, ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਲਈ ਇਕ ਸ਼ਬਦ, ਸ਼ਬਦ ਜੁੱਟ, ਵਿਰੋਧਆਰਥਕ ਸ਼ਬਦ, ਸਮਨਾਮੀ ਸ਼ਬਦ
ਅ) ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਮਾਰਕੀਟ/ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ। **10+5=15 ਅੰਕ**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਭਾਗ ਪਹਿਲਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹਨ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਪੰਜ-ਪੰਜ ਨੰਬਰ ਹਨ। **15 ਅੰਕ**
2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਨੰਬਰ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। **10 ਅੰਕ**
3. ਭਾਗ ਤੀਸਰਾ ਦੇ (ੳ) ਭਾਗ ਵਿਚੋਂ ਦੋ ਸਵਾਲ ਅਤੇ (ਅ) ਭਾਗ ਵਿਚੋਂ ਇਕ ਸਵਾਲ ਪੁਛਿਆ ਜਾਵੇਗਾ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। **10+5=15 ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ ੧੦ ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 40+10 = 50 ਹਨ।

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II**(FST-203 INTRODUCTION TO COMPUTERS)****Time: 3 Hours****Max. Marks: 60
Theory Marks: 30
Practical Marks: 18
Internal Marks: 12****Instructions for the Paper Setters:**

Theory: – Question paper will contain seven questions in all and students will be asked to attempt any four questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I**

FUNDAMENTAL OF COMPUTER : Introduction to computer, Applications of computer. Components of computer. Primary and Secondary storage. Number systems.

INTRODUCTION TO WINDOWS : Parts of window screen (Desktop, Window, Icons), Start menu, Taskbar, settings, application & document window, anatomy of a window (Title bar, minimize, maximize button, control box, scroll bars, scroll buttons, scroll boxes), Window explorer (expansion, collapsing of directory free, copying, moving, deleting files, folder, creating folders), About desktop icons (recycle bin, my computer, network neighborhood, briefcase), folder, shortcut creation, setting of screen saver, color settings , wallpaper, changing window appearance.

UNIT-II

MS-WORD : Introduction to MS-word, Parts of window of word (Title bar, menu bar, status bar, ruler), Creation of new document, opening document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header, footer, deleting, moving replace, a filing text in document. Saving a document, spell checker, printing a document, creating a table, entering editing text in tables, changing format of table, height width of row or column Editing, deleting, rows, Columns in table. Borders, shading, Templates, Wizards drawing objects, mail merge.

UNIT-III

MS-POWER POINT : Introduction, elements of Power Point Package, starting Power Point, Exploring Power Point menus, starting a new slide, Adding Titles, Text and Art, Moving text area and resizing text box starting a slide show, saving a presentation, printing slides, opening an existing presentation, Inserting and deleting slides in a presentation, changing text and correcting error, checking spelling, adding header and footer, closing a presentation, To quit from Power Point views, slide setup, setting up slide show, setting transistors and slide timings, Automatic slide show, Formatting and Enhancing text, Slide with graph.

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II

(FST-203 INTRODUCTION TO COMPUTERS)

PRACTICALS:

WINDOW-95:

1. Change the Background of the Desktop and also set the screen saver.
2. Create a Folder RAMAN and also create a Folder MOHAN within the RAMAN folder.
3. Create a short cut of MS-Word on the desktop.
4. Delete some files from the MOHAN folder and also recall these files from the Recycle Bin.
Empty the remaining recycle bin.
5. Copy some files from the C drive to floppy drive A using the Windows Explorer facility.

MS-WORD:

1. Create a document files, save it and print it.
2. Spell check the created document file.
3. Create a Table and sort the data within the table.
4. Mail Merge a invitation to your friends.
5. Apply border to a particular paragraph and shade it 10% with Background yellow color.

MS-POWER POINT:

1. Create a presentation, save it and print it.
2. Format a presentation with changing the fonts and size and selecting text style and colors.
3. Create a graph ; add titles, axes and legends to a graph.
4. Add a Clipart picture to a chart.

Book Recommended:

PC Software by Rachhpal Singh & Gurinder Singh.

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II

(FST – 204 GENERAL MICROBIOLOGY)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Introduction : Discovery of microbial world, theory of spontaneous generation, Germ theory of disease, Koch's postulates, Pure culture concept, Nature and properties of prokaryotic and eukaryotic micro-organisms.

Microscopy: Light microscope – Resolving power, Magnification, Bright field, Dark field, Electron microscopy– Transmission Electron microscope, Scanning electron microscope.

UNIT-II

General characteristics and Nutritional requirements: General characteristics of bacteria, yeast, mold, viruses, algae. Types of bacteria, nutritional classification of bacteria.

Reproduction of micro-organisms: Brief account of bacteria, yeast and mold reproduction.

UNIT-III

Microbial Growth : Definition of growth, growth cycle, growth rate, generation time, measurement of growth, effect of environmental factors such as temperature, oxygen, moisture, salt, pH, oxidation- reduction potential and radiations on growth.

Control of Micro organisms: Control of micro organisms by physical, chemical and other chemotherapeutic agents.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II

(FST – 204 GENERAL MICROBIOLOGY)

Practicals:

1. To study different parts of a microscope.
2. Study of instruments (Autoclave, Hot air oven, Incubator, Laminar flow, pH meter, and spectrophotometer) of microbiology laboratory.
3. Preparation of nutrient agar and MacConkey's Agar plates, slants and broth.
4. To study the serial dilution method.
5. To perform pour plate, spread plate and streak plate methods for isolation and enumeration of micro-organisms.
6. To demonstrate acid fast staining.
7. To stain the given bacteria by Gram's staining method.
8. To measure the size of given micro-organisms by ocular and stage micrometer.
9. To determine the number of micro-organisms with a Haemocytometer.
10. To determine the motility of bacteria by hanging drop method.

Books Recommended:

1. Microbiology by Pelczar M.J., Chan E.C.S. & Krieg N.R., 5th Ed., 1987. McGraw Hill Co, Singapore.
2. General Microbiology by Stanier R.Y., In graham J.L., Wheelies M.L. & Painter P.R. 5th Ed. 1993, The Macmillan Press Ltd., London.
3. Microbiology: A Laboratory Manual by Cappuccino J.G. & Sherman N., 2004. Benjamin-Cummings Publishing Co., USA.
4. Laboratory Manual in Microbiology by Gunase Karan P, 1996, New Age International (P) Ltd. New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II

(FST – 205 FOOD CHEMISTRY)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT – I

Introduction- Importance of food chemistry. Water in foods, structure and its properties. Water activity, free and bound moisture.

Carbohydrate: Functional properties of sugars and polysaccharides in foods, chemical reactions of carbohydrates-Hydrolysis, Enolization, Mutarotation, Dehydration, Browning reactions, Gelatinization and Retrogradation of starch.

Proteins: Common food proteins, Functional properties of proteins, Denaturation, renaturation, Gelation, and Hydrolysis of proteins.

UNIT – II

Lipids: Physical characteristics of lipids, chemical properties of fats (hydrogenation, interesterification, oxidation-rancidity & reversion), Edible fats and oils, Tests to check purity of fats and oils, Emulsions, Lipids of biological importance like cholesterol and phospholipids, functional properties of lipids. Effect of processing on lipids and nutritional aspect of lipids.

UNIT – III

Enzymes: Nomenclature, Definition, mechanism of enzyme action, factors affecting enzyme action, Enzyme inhibition, enzymes important in foods.

Coloring and Flavoring agents: Brief introduction.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II

(FST – 205 FOOD CHEMISTRY)

Practicals:

1. Determination of reducing sugar in the given food sample.
2. Nitrogen analysis by micro-kjeldahl method.
3. Determination of salt in food products.
4. Qualitative analysis of carbohydrates.
5. Qualitative analysis of proteins in given sample.
6. Qualitative analysis of lipids in the given sample.
7. Determination of food enzymes.
8. Estimation of vitamin C.

Books Recommended:

1. Food Chemistry by L. H. Mayer.
2. Hand Book of Analysis of Fruits & Vegetables by S. Ranganna.
3. Food Chemistry by Fennemma.

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -II

(FST – 206 FOOD ADDITIVES)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Definitions, nutritional and non-nutritional food additives, uses and functions of Acid, Base, Buffer systems, Salts and chelating/sequestering agents. Low calorie and non nutritive sweeteners.

UNIT-II

Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, Humectants, thickeners, firming agents.

Flour bleaching agents and Bread improvers.

UNIT-III

Anti microbial agents / Class I and Class II preservatives, Food colour, pigments, their importance and utilization, Flavoring agents and related substances, Clarifying agents.

Practicals:

1. Description of generally recommended as safe (GRAS) food additives.
2. Spectrophotometric method for total chlorophyll.
3. Clarification of fruit juices,
4. Use of additives in bakery, fruits, vegetables, milk and meat products.
5. Determination of adulteration in milk, cereals, oils & fats, spices.

Books Recommended:

1. Food Chemistry, O.R.Fennema
2. Food Chemistry, Belitz, Grosch
3. Food Facts & Principles by Shakuntala Manay N & Shadoksharaswamy N, 1996, New Age, World Publishers.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 301 FOOD MICROBIOLOGY)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Introduction - Origin of food microbiology as science, Food as nutrient for various microorganisms, Factor affecting the growth and survival of microorganisms in foods, General features and importance of different groups of bacteria, yeasts and molds important in foods.

Methods for microbial examination of foods - Traditional, non-traditional and rapid methods for the microbial examination of food and food products.

UNIT-II

Food Spoilage - Microbial and biochemical aspect of food spoilage, role of bacteria, yeast and molds in food spoilage, Spoilage of cereal and cereal products, fruits and vegetables, meat and meat products, milk and milk products, fish and fish products, spoilage of egg and poultry and heated canned foods.

UNIT-III

Food Borne Illness - Food intoxication and food infection, Bacterial food poisoning by *Staphylococcus aureus*, *Clostridium botulinum*, *Salmonella*, *E. coli*, *Clostridium perfringens*, *Listeria monocytogenes*, and *Campylobacter jejuni*, Food borne viruses, Aflatoxigenic molds, Investigation of food borne disease outbreak

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 301 FOOD MICROBIOLOGY)

Practicals:

1. Sterilization and disinfection of equipment used in food microbiology laboratory.
2. Preparation of media, slant and broths required in the microbial analysis of foods.
3. To count the number of microorganisms by direct microscopic count method.
4. Study of different types of microorganism colony shapes on agar plates.
5. Study of the capsular and spore staining methods.
6. Isolation of fungi from food materials.
7. Study of incubation test of heated canned foods.
8. Study of Dye reduction test of milk.
9. Microbiological analysis of egg, cereal product and fruit product.

Books Recommended:

1. Frazier WC and Westoff DC "Food Microbiology" 4th edition Tata Mcgraw-Hill Publishing
2. Jay JM "Modern Food Microbiology" 3rd edition CBS Publishers and distributors Delhi 1987
3. Adams MR and Moss MO "Food microbiology" New Age International (P) Ltd. 1996
4. Gunasekaran P. "Laboratory Manual in Microbiology", New Age International (P) Ltd. 1996.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 302 FLUID MILK PROCESSING)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I**

Milk: Definition, composition of milk, important characteristics of major constituents of milk i.e. milk fat, milk proteins, lactose and minerals and minor constituents of milk. Factors affecting the quality and quantity of milk produced by milch animals. Physical, chemical and nutritive properties of milk.

UNIT-II

Market Milk: Brief introduction to Standard milk, Toned milk, Double toned milk, Flavoured milk, Vitamin enriched milk, Reconstituted milk and recombined milk. Legal and ISI standards of milk. Adulteration of milk and its detection. Common preservatives used in milk and their detection. Clean milk production.

UNIT-III

Milk Processing: Processes of straining, filtration and clarification.

Standardization: Definition of standardization, purpose and uses of standardization process. Use of Pearson's square method to solve the standardization problems in dairy industry.

Homogenization: Definition, Effect of homogenization on milk. Uses of homogenization. Checking the effectiveness of homogenization.

Pasteurization : Definition, purposes and objects of pasteurization – LTLT and HTST processes of pasteurization.

Sterilization: Definition, Method for manufacturing sterilized flavoured milk. UHT process.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 302 FLUID MILK PROCESSING)

Practicals:

1. Sampling equipment and sampling of milk.
2. Platform tests (Acidity, COB and Alcohol test).
3. Organoleptic Tests.
4. Determination of milk fat percentage by Gerber's method.
5. Determination of specific gravity by lactometer.
6. Determination of SNF percentage and TS percentage of milk with lactometer.
7. Detection of common adulterants and preservatives of milk.
8. Reporting on the suitability of milk for heat processing.
9. Reporting on the quality of given sample of milk.
10. Visit to milk processing plants/NDRI, Karnal.

Recommended Books:

1. Outlines of Dairy Technology by Sukumar De, 1980, Oxford University Press, New Delhi.
2. Milk & Milk Products by Eckles, CH, Combs WB, Macy H, 1997, McGraw Hill Book

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 303 PROCESSING OF MEAT & MEAT PRODUCTS)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

1. Scope of meat processing industry in India.
2. Structure, composition & nutritive value of meat.
3. Classification of meat - Mutton, Pork & Sheep.
4. Meat quality parameters- Meat color, water holding capacity, Marbling, firmness & factors affecting it.

UNIT-II

5. Ante-mortem examination of meat animal, their slaughtering & dressing.
6. Postmortem changes in meat: Rigor mortis, biochemical changes associated with rigor-mortis, conversion of muscle to meat.
7. Methods of tenderization, factors affecting tenderness.

UNIT-III

8. Chilling, freezing, canning, drying, curing & smoking of meat.
9. Mechanical deboning of meat, Restructured meat products, Inter-mediate moisture meats, Meat by-products.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 303 PROCESSING OF MEAT & MEAT PRODUCTS)

Practicals:

- 1) Pre slaughter operations of meat animals.
- 2) Slaughtering and dressing of meat animals.
- 3) Study of post-mortem changes.
- 4) Evaluation of meat quality.
- 5) Preservation of meat by different methods
- 6) Preservation of meat by pickling method.
- 7) Preparation of different meat products- canned dehydrated and barbecued.
- 8) Preparation of sausages, burger, kabab, meat balls, meat patties.
- 9) Visit to slaughter houses.

Books Recommended:

- 1) The Meat We Eat by Romans. JR and Costllo WJ, Carlson WC, Greaser ML
and Jones KW, 2004, Interstate Publishers, USA.
- 2) Meat Science & Applications by Y.H.Hui, Wai-Kit Nip, Robert W. Rogers and
Owen A. Young.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III
(FST – 304 POST HARVEST MANAGEMENT OF FRUITS & VEGETABLES)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Present status of post harvest technology in India.

Importance and role of post harvest technology.

Post harvest losses of fruits and vegetables and factors affecting the post harvest losses. Post harvest changes in fruits and vegetables Harvesting methods – manual and mechanical.

UNIT-II

Maturity indices of fruits and vegetables-Importance of maturity indices, determination of harvest maturity Climacteric and Non climacteric fruits, Fruit ripening and changes, Ethylene biosynthesis.

Cleaning, Sorting & Grading of fruits and vegetables

UNIT-III

Post harvest physical and chemical treatments to enhance the shelf life of fruit and vegetables.

Transportation methods of fruits and vegetables Storage of fruits and vegetables Post harvest diseases of fruits and vegetables, Post harvest loss assessment and loss reduction.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 304 POST HARVEST MANAGEMENT OF FRUITS & VEGETABLES)

Practicals:

1. Analyze the maturity stages of fruits and vegetables.
2. To study the effect of pre-packing of fruits and vegetables.
3. To study the effect of pre-cooling of fruits and vegetables.
4. To study the ripening of fruits and vegetables.
5. To study the shelf life of fruits and vegetables at low- temperature.
6. To study the different types of spoilage in fruits and vegetables.
7. To determine the optimum temperature for storage of different fruits and vegetables.
8. To study the effect of wax coating on shelf life of fruits and vegetables.
9. Visit to a cold store and controlled atmosphere storage.

Books Recommended:

1. Preservation of fruits and vegetables by Girdhari Lal, Sidappa G S and Tandon G L, 1960, ICAR, New Delhi.
2. Food facts & principles by Shanuntala Manay N & Shadoksharaswamy N, 1996, New Age World Publisher, CA.
3. Food Science by Potter, N.N., CBS Publisher, New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 305 CEREAL MILLING AND LEGUMES)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Cereal grain definition and different types of grains.

Structure and chemical composition of wheat, rice, maize and barley.

Milling criteria and quality criteria for grains.

UNIT-II

Wheat cleaning and conditioning, traditional and modern milling of wheat and flour extraction rate.

Wheat flour- types and usage, Improvers and Bleachers - their principle and action.

Traditional and modern milling of paddy.

Dry and wet milling of corn.

UNIT-III

Introduction and chemical composition of pulses.

Decortication and polishing of pulses.

Toxic constituents of pulses and their elimination.

Practicals:

1. Determination of physical characteristics of wheat.
2. Determination of physical characteristics of rice.
3. Determination of moisture, ash and crude fibre in cereal grains.
4. Milling of wheat into flour.
5. Milling of paddy to brown rice and white rice.
6. Cooking quality of rice.
7. Visit to flour mill, rice mill and pulse mill.

Recommended Books:

1. Technology of Cereals by Kent N. L. and Evers AD, 4th Ed., 1983, Woodhead Publishing Ltd., UK.
2. Principle of Cereal Science & Technology by Kent. NL, 1983, Pergamon Press, London, UK.
3. The Chemistry & Technology of Cereal as Food & Feed by Maiz S.A, 1996, CBS Publishers, New Delhi.
4. Food Science by Potter NN, 5th Ed., 2006, CBS Publisher, New Delhi.
5. Technology of cereal, legume and oil seeds by Chakrobarty S. Deor, IBH Publisher.

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III**(FST – 221 ENVIROMENTAL STUDIES-I)****Time: 3 Hours****Max. Marks: 50
Theory Marks: 40
Practical Marks: 00
Internal Marks: 10****Instructions for the Paper Setters:**

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Section A (12 Marks): It will consist of five short answer type questions. Candidates will be required to attempt three questions, each question carrying five marks. Answer to any of the questions should not exceed two pages.

Section B (16 Marks): It will consist of four essay type questions. Candidates will be required to attempt two questions, each question carrying ten marks. Answer to any of the questions should not exceed four pages.

Section C (12 Marks): It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

1. The multidisciplinary nature of environmental studies:

- Definition, scope & its importance.
- Need for public awareness.

2. Natural resources:

- Natural resources and associated problems:
 - a) Forest resources:** Use of over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
 - b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - c) Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
 - d) Food resources:** World food problems, change caused by agriculture and overgrazing, effects or modern agriculture, fertilizer-pesticide problem, salinity, case studies.
 - e) Energy resources:** Growing of energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.
 - f) Land recourses:** Land as a resource, land degradation, soil erosion and desertification.
 - Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -III

(FST – 221 ENVIROMENTAL STUDIES-I)

3. Ecosystem:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystems:
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

4. Social Issues and Environment:

- From unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environmental Protection Act:
 - Air (prevention and Control of Pollution) Act.
 - Water (prevention and Control of Pollution) Act.
 - Wildlife Protection Act.
 - Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV**(FST – 401 PROCESSING OF MILK PRODUCTS-I)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:**

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I**

Cream: Different types of cream with their respective fat content, composition of cream, production methods: gravity methods, mechanical method- by the use of cream separator. Factors affecting the richness of cream produced by cream separator. Efficiency of cream separator. Care of cream separator. Selection of site for setting up creamery.

Neutralization of cream, use of different types of neutralizers, double neutralization of cream. Ripening of cream for butter making: natural ripening, ripening with the use of starter cultures. Objects of cream ripening. Various changes during the ripening of cream.

UNIT-II

Butter : Types of butter, composition. Preparation of butter. Factors affecting the churn ability of cream. Churning theories.

Grading of butter:

1. Requirements of grading room
2. Grading procedure
3. Score card method.

Defects of butter their possible causes and their remedies.

Standards of butter and shelf life.

UNIT-III

Ghee: Manufacturing methods of ghee:

1. Cream method
2. Butter method
3. Pre-stratification method

Granularity in ghee, storage of ghee and shelf life.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV

(FST – 401 PROCESSING OF MILK PRODUCTS-I)

Practicals:

1. To study the construction and working of a cream separator.
2. Cream separation.
3. Neutralization of cream.
4. Ripening of cream.
5. Preparation of Butter.
6. Determination of moisture content in butter.
7. Preparation of ghee from cream.
8. Preparation of ghee from butter.
9. Visit to different milk plants to learn about cream, butter and ghee processing operations.
10. Visit to N.D.R.I., Karnal.

Recommended Books:

1. Outlines of Dairy Technology by Sukumar De, 1980, Oxford University Press, UK.
2. Milk & Milk Products by Eckles, Combs, Henery C, and Willes C, 1997, Tata McGraw Hill Publishers, USA.
3. Principles of Dairy Processing by Warner JN, 1976, Wiley Science Publishers, USA.

(Signature)

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV

(FST – 402 EGG, POULTRY AND FISH TECHNOLOGY)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Structure and composition of egg. Nutritive value, interior qualities, grading, handling, packaging, storage, transportation, freezing, pasteurization, de-sugarization, dehydration, functional properties of eggs.

UNIT-II

Types of Poultry –Hen, Turkey, Ducks, Geese. Ante-mortem examination & slaughtering of hen. Poultry sanitation & waste disposal. MAP of Poultry.

UNIT-III

Types of fish, composition, structure and nutritive value, post – mortem changes in fish, on-board handling, storage and transportation of fish, curing, smoking, salting, canning, freezing and drying of fish, Comminuted Fish Products, Fish protein concentrate, Packaging of fish, Utilization of fish and marine industry by-products.

Practicals:

1. Slaughtering of hen.
2. Determination of egg components.
3. Grading and quality evaluation of eggs.
4. Preservation of shell eggs.
5. Preparation of egg products, boiled, fried, poached, scrambled, omellette.
6. Determination of egg density
7. To check freshness of fish.
8. Chilling & freezing of fish.
9. Preparation of fish & marine products.
10. Visit to industry.

Books Recommended:

1. Egg Science and Technology by Stadelman WJ, and Cotterill OJ, 2002, CBS Publishers, New Delhi.
2. Poultry Meat and Egg Production by Parkhurst C. and Mountney GJ, 2002, CBS Publishers, New Delhi.
3. Fish Processing & Preservation by Charles L. Cutting

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV

(FST – 403 FRUITS & VEGETABLE PROCESSING)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Classification, chemical composition and nutritive value of fruits and vegetables.

Preparing fruits and vegetables for processing-washing, sorting, grading, peeling, blanching, cutting, destoning and pitting.

Canning and bottling of fruits and vegetables products.

UNIT-II

Freezing- General Methods of freezing of fruits and vegetables, their packaging and storage.

Drying of fruits and vegetables.

Definition, formulation, preparation and standards of fruit juices, Squashes and cordials; Fruit syrups, nectar, RTS, pulp.

UNIT-III

Preparation and standards of Jam, Jelly & marmalades, preserve candied and crystallized fruits.

Preparation of Pickles.

Tomato processing-Tomato juice, puree, paste, chutney, sauce, soup and ketchup.

Practicals:

1. Preparation of fruit juice.
2. Preparation of squashes.
3. Preparation of jam, jellies, marmalade.
4. Preparation of potato chips.
5. Preparation of pickles- sweet and sour.
6. Dehydration and sun-drying of fruits and vegetables.
7. Preparation of tomato puree, paste and ketchup.
8. Organoleptic evaluation of fruits and vegetable products.
9. Visit to food industry.

Recommended Books:

1. Preservation of Fruits and Vegetables by Girdhari Lal , Sidappa G S and Tandon G L, 1960, ICAR, New Delhi.
2. Food Facts & Principles by Shanuntala Manay N & Shadoksharaswamy N ,1996, New Age World Publisher, CA.
3. Food Science by Potter, N.N., CBS Publisher, New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV

(FST – 404 PROCESSING OF CEREALS AND LEGUMES)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Quality criteria for wheat flour, physical dough testing instruments, major and minor ingredients used for bakery products, leavening agents.

Preparation methods of bread, cookies and cakes.

UNIT-II

Parboiling of paddy-methods, advantages and disadvantages, various changes during parboiling

Storage and uses of rice bran, extraction of rice bran oil and its use.

Corn starch and corn sweeteners.

UNIT-III

Malting of barley, malt and its uses.

Brewing of barley to prepare beer.

Pulse protein concentrates-soybean curd and milk.

Protein enriched cereal foods.

Practicals:

1. Preparation of bread, biscuits and cakes.
2. Parboiling of paddy.
3. Estimation of free fatty acids in flour and rice bran.
4. Determination of dry and wet gluten in flour.
5. Malting of barley.
6. Extraction of oil from rice bran.
7. Visit to food industry.

Recommended Books:

1. Technology of Cereals by Kent N. L. and Evers AD, 4th Ed., 1983, Woodhead Publishing Ltd., UK.
2. Principle of Cereal Science & Technology by Kent. NL, 1983, Pergamon Press, London, UK.
3. The Chemistry & Technology of Cereal as Food & Feed by Maiz S.A, 1996, CBS Publishers, New Delhi.
4. Food Science by Potter N, 5th Ed., 2006, CBS Publisher, New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV

(FST – 405 FOOD PLANT HYGIENE AND SANITATION)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Importance of personal hygiene of food handler-habits, clothes, illness, education of handler in handling and service.

Cleaning agents and disinfectants.

UNIT-II

Cleaning methods – sterilization, disinfection, heat & chemicals, chemical tests for sanitizer strength.

Food sanitation-Principles & methods, control, inspection.

Sanitation in fruits & vegetables industry, cereals industry, dairy industry, meat, egg & poultry units.

UNIT-III

Control of infestation, rodent control, vector control, Use of pesticides.

Hygiene of water used for processing.

Planning & implementation of training programmes for health personnel.

Practicals:

1. Sterilization of equipments used in the laboratory by using heat and chemicals.
2. Determination of B.O.D
3. Determination of C.O.D
4. Determination of sanitary status of plant equipment.
5. Chlorination of water.
6. To study the bacteriology of water.
7. Chemical analysis of water.

Recommended books:-

1. Principles of Food Sanitation by Marriott, 5th ed., 2006, CBS Publisher, New Delhi.
2. Hobbs, B. C. and R. J. Gilbert Food Poisoning and Food Hygiene , 4th edition The English Language Book Society and Edward Arnold.
3. Longree K. (1967), Quantity Food Sanitation, Inter science Publishers, New York.
4. Kawata, K. (1963) Environmental Sanitation in India, Lucknow Publisher, New York.
5. Principles of food sanitation –II Edition, AVI Book, Van Nostrand Reinhold, New York.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER -IV**(ESL – 222 ENVIRONMENTAL STUDIES -II)****Time: 3 Hours****Max. Marks: 50**
Theory Marks: 40
Practical Marks: 00
Internal Marks: 10

Section A (12 Marks): It will consist of five short answer type questions. Candidates will be required to attempt three questions, each question carrying five marks. Answer to any of the questions should not exceed two pages.

Section B (16 Marks) : It will consist of four essay type questions. Candidates will be required to attempt two questions, each question carrying ten marks. Answer to any of the questions should not exceed four pages.

Section. C (12 Marks): It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

1. Biodiversity and its Conservation:

- Definition: Genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and option values.
- Biodiversity of global, National and local levels.
- India as mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity.

2. Environmental Pollution:

- Definition, causes, effects and control measures of:
 - a) Air Pollution
 - b) Water Pollution
 - c) Soil Pollution
 - d) Marine Pollution
 - e) Noise Pollution
 - f) Thermal Pollution
 - g) Nuclear Hazards
 - h) Electronic Waste
- Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster Management: Floods, Earthquake, Cyclone and Landslides.

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3. Human population and the environment

- Population growth, variation among nations.
- Population explosion-Family welfare programme.
- Environment and human health.
- Human rights.
- Value education.
- HIV/AIDS.
- Women and child welfare.
- Role of information technology in environment and human health.
- Case studies.
- Road Safety Rules & Regulations: Use of Safety Devices while Driving, Do's and Don'ts While Driving, Role of Citizens or Public Participation, Responsibilities of Public under Motor Vehicle Act, 1988, General Traffic Signs.
- Accident & First Aid: First Aid to Road Accident Victims, Calling Patrolling Police & Ambulance.

4. Field Visits:

- Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain.
- Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems—pond, river, hill slopes etc.

Note: In this section the students will be required to visit and write on the environment of an Area/ ecosystem/village industry/disaster/mine/dam/agriculture field/waste management/ Hospital etc. with its salient features, limitations, their implications and suggestion for improvement.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - V**(FST – 501 PRINCIPLES OF FERMENTATION TECHNOLOGY)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:**

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I**

Introduction to fermentation, Fermentation an ancient tradition, Developments in fermentation technology, Scope and future prospects of fermentation microbiology, Gaden's fermentation classification, Rate of microbial growth and death, Rate of Product formation, Classification of food fermentations - Alcoholic, lactic and acetic acid fermentations

UNIT-II

General methods of fermentation – Aerobic fermentation, Anaerobic fermentation, Solid state fermentation, and submerged fermentation, Batch and continuous fermentation. Pre-requisite for Industrial fermentation process,

UNIT -III

Component parts of a fermentor and their functions, Peripheral parts and accessories of a fermentor, Online and off-line devices of fermentor, Biosensors in fermentation monitoring, Common measurement and control systems in fermentor, Contamination problems in fermentation process, Computer applications in fermentation process.

Practicals:

1. To study different parts of a fermentor
2. To study the operation /working of a fermentor
3. To study media formulation and sterilization of a fermentation process
4. To study the growth of given microorganism in a batch culture
5. To perform fermentation test for a given microorganism
6. To study the effect of different temperatures on growth of a given Microorganism
7. To study the effect of aeration on growth kinetics of a given Microorganism
8. To study the product synthesis kinetics of any microorganism

Recommended Books:

1. Principles of Fermentation Technology by Stanbury and Whittaker
2. Biotechnology: Food Fermentation by VK Joshi & Ashok Pandey
3. Comprehensive Biotechnology by Moo and young (4 volumes)

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - V

(FST – 502 FOOD PACKAGING - I)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Packaging Technology:Definitions, functions of packaging. Properties of packaging material in relation to these functions, package design, Tests for flexible packaging materials , different levels of packaging, materials used in packaging, types of containers-primary & secondary, flexible & rigid, hermetic & non hermetic.

UNIT-II

Packaging materials :Wood- structure,types, properties and wooden containers used in packaging, types of wooden boxes

paper and paper board- structure, making, properties ,types and uses of paper and paper board, CFB boxes and their comparison with wooden containers

Glass – composition ,properties,structure,types & manufacture of glass containers, their uses, breakage in glass , closure for glass containers.

UNIT-III

Metals- properties of metals,different metals used in food packaging,steel plate and functions of various constituents of steel, formation of two piece and three piece cans,tinning process, tin free steel, aluminium containers ,lacquering –type and applications, aluminium foil ,corrosion of metal cans.

Practicals:

1. To determine basis weight of paper and paper board
2. To determine thickness of paper and paper board
3. To determine Cobb's value of a paper board
4. To find out the uniformity and amount of wax on wax paper
5. To determine the thermal shock resistance of a glass container
6. To find out the porosity of tin plate.
7. To find out the tin coating weight.
8. To identify the different types of packaging materials

Recommended Books

1. Food Packaging Materials – M. T. Crosby.
2. Food Packaging Materials – M. Mahadevish R.V. Gowramma.
3. Food Packaging – Stanley Sacharow
4. Food Packaging –Principles & Practices _ Gordon L. Robertson
5. A Handbook of Food Packaging, Frank – A – Paine, Heather Y. Paine

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - V

(FST – 503 CONFECTIONERY & SUGAR TECHNOLOGY)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Composition and characteristics of cane Juice, Cane Juice extraction. Manufacturing of sugar.

UNIT-II

Deterioration of sugars during storage & transportation and its prevention, By-products of sugar industry and their utilization.

UNIT-III

Classification of confectionary. Hard and soft boiled sugar confectionary: fondant, fudge, caramel, toffee butterscotch, Sugar panning, hard boiled candy.

Practicals:

1. Quality testing of raw as well as finished products of confectionary.
2. Preparation of: 1. candies, 2.caramel 3.toffees.
3. Collection of various types of confectionary packages.
4. Determination of sugar in confectionary product by saccharometer.
5. Determination of refractive index of sugar – solutions of different consistencies.
6. Organoleptic testing of different confectionary products.
7. Visit to sugar and confectionary industry

Recommended Books:

1. Chocolate, Cocoa and Confectionary: Science & Technology by Minife, 1997, AVI Publishing Co., New York.
2. Handbook of Cane Sugar Technology by Mathur RBL, 1986, Oxford & IBH Publishing Co., New Delhi.
3. The Science of Cookie & Cracker Production by Faridi H., 1994, Chapman & Hall, UK.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - V

(FST – 504 OIL & FAT TECHNOLOGY - I)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. All questions will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Introduction to oils and fats and their nomenclature.

Physical and chemical Properties of fats and oils.

UNIT-II

Nutritional importance of oils and fats.

Source and physico-chemical properties of following oils:-

- a) Animal – Butter oil, lard and tallow.
- b) Plant – Groundnut, Sunflower, Soybean and Coconut oil.

UNIT-III

Extraction of oils/fats.

Problems during storage – rancidity, reversion.

Practicals:

1. To determine moisture content of oilseed
2. To determine FFA of oil
3. Determination of Iodine Value, R.M. Value and Polenske Value
4. To determine Saponification value, anisidine value and peroxide value of oil.
5. Determination of melting point of fats.
6. Detection of sesame oil in vanaspati by furfural test.
7. Detection of adulteration with mineral oil, Cotton seed oil or Ground nut oil.
8. Organoleptic evaluation of fats and oils
9. Visit to vegetable oils industry.

Recommended Books:

1. Food Chemistry by Meyer LH, 2006, CBS Publisher, New Delhi
2. Food Science by Potter NN, 5th Ed, 2006, CBS Publisher, New Delhi
3. Food Oils & Fats: Technology, Utilization and Nutrition by Lawson H, 1995, CBS Publisher, New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - V

(FST – 505 PROCESSING OF MILK PRODUCTS - II)

Time: 3 Hours

Max. Marks: 80
 Theory Marks: 40
 Practical Marks: 24
 Internal Marks: 16

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical: – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I**

Cheese: Classification of cheese. Quality of milk for cheese making.

Preparation method of cheddar cheese.

Paneer and Channa: Manufacturing processes.

UNIT-II

Condensed and evaporated milk: Definition, composition & standards. Condensing operations.

Dried milk products: Introduction, objects of production, standards and composition.

Preparation of dried milk and milk powder by roller and spray drying methods. Packaging and storage. Malted milk powders and infant milk food.

UNIT-III

Ice Cream: Different types of ice creams and their composition. BIS requirements of ice-cream, Ingredients used and their role in processing. Manufacturing process. Defects of ice cream, their causes and remedies.

Indigenous milk products: Kulfi, Srikhand, Lassi and Rabri.

Khoa : Preparation of Khoa, Physico-chemical changes in milk on its conversion into khoa. Shelf life of khoa. BIS and legal standards of different milk products.

Practicals:

1. Preparation of flavored milk.
2. Preparation of Khoa.
3. Preparation of Paneer and Channa.
4. Preparation of common varieties of ice-cream.
5. Visit to different milk plants to learn about milk condensing and drying operations.
6. Visit N.D.R.I., Karnal.

Recommended Books:

1. Outlines of Dairy Technology by Sukumar De, 1980, Oxford University Press, UK
2. Milk & Milk Products by Eckles, Combs, Hennery C, and Wiles C, 1997, Tata McGraw Hill Publishers, USA.
3. Principles of Dairy Processing by Warner JN, 1976, Wiley Science Publishers, USA

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VI

(FST – 601 QUALITY ASSURANCE)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical:– Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

UNIT-I

Objectives, importance and functions of quality control. Methods of quality assessment of food materials fruits, vegetables, cereals, dairy products, meat, egg and processed products.

UNIT-II

Sampling, specifications of raw materials and finished products. Sensory evaluation.

UNIT-III

SQC and control chart technique: Concept of ISO 9000.

Quality Attributes: Size, Shape, Colour, Aroma, Texture

Practicals:

1. Quality evaluation of milk & milk products.
2. Quality evaluation of cereals.
3. Quality evaluation of fruits and vegetables.
4. Quality evaluation of Oils & Fats.
5. Quality evaluation of Meat & Poultry.
6. Adulterants in milk, cereals, oils & fats and their detection.

Recommended Books:

1. Quality Control for Food Industry by Kramer A, Twigg BA, 1970, AVI Publishers, USA.
2. Handbook of Analysis and Quality Control for Fruits & Veg. Products by Ranganna S, 2nd Ed., 2000, Tata McGraw Hill, New Delhi.
3. Food Science by Potter NN, 5th Ed, 2006, CBS Publishers New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VI

(FST – 602 GRAIN STORAGE)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical:– Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory :

UNIT-I

General problems of storage. Sources and detection of infestation in stored food grains.

Causes, types and content deterioration in stored food grains and methods to check them. Traditional and modern methods of bag and bulk storage.

UNIT-II

Insect pest of stored grain. Chemical, non chemical and integrated methods of controlling stored grain insect pest.

Toxic contamination in good grains, their ill effects.

UNIT-III

Pesticidal contamination tolerance limits, residue and precautions of safe handling of pesticides. Cleaning aeration and drying of stored products at farmers, commercial and Govt. levels.

Role of moisture in spoilage of stored grains. Categorization of food grains for storage, Principle of godown sanitation and hygiene.

Practicals:

1. To study various insect pests of grains.
2. To study the quality tests for grains.
3. To store the grains and check its shelf life.
4. To study the various pesticides used for grain storage.
5. To study the effect of moisture on spoilage of grains.
6. Visit to grain storage godowns.

Recommended Books:

Introduction of Insect – By Metalf & Lukemann.
 Pesticides and Pollution – By Mollan.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VI

(FST – 603 FOOD PACKAGING-II)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical: – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Plastics-thermoplastics&thermosets

Polyethylene,polypropylene,polyvinylchloride,polyvinylidenechloride,polyester, polystyrene & polyamide,rubber hydrochloride (properties and uses)

polymerization and processing of plastics-compression moulding, injection moulding, blow moulding, thermoforming and extrusion,coextrusion,calendaring, orientation.

UNIT-II

Plastic containers-bottles, cans, jars, cups, tubes ,cartons, retort pouch, laminates

cellophane –preparation , properties and uses

biodegradable plastics

Aseptic packaging, shrink packaging ,gas packaging , vacuum and modified atmosphere packaging

UNIT-III

Techniques & methods used for Packaging of cereals and cereal product, fruits and vegetables & their products , milk and milk products and meat and meat products , beverages

Shelf life evaluation of packed products

Food packaging & environment-recycling, composting, thermal treatment& land fill.

Practicals:

1. To determine the sorption isotherm of a given sample of food.
2. Shelf life studies of packaging foods.
3. To determine grease resistance of packaging materials.
4. To see the chemical resistance of packaging material.
5. Determination of water vapour transmission rate of various packaging materials
6. Identification of packaging materials
7. To study the different layers of a laminate
8. Visit to various industries, dealing with food packaging materials like / paper, board and metal cans.

Recommended Books

Food Packaging Materials – M. T. Crosby.

Food Packaging Materials – M. Mahadevish R.V. Gowramma.

Food Packaging – Stanley Sacharow

Food Packaging –Principles & Practices _ Gordon L. Robertson

A Handbook of Food Packaging, Frank – A – Paine, Heather Y. Paine

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VI

(FST – 604 SPICES & FLAVOUR TECHNOLOGY)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical: – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Classification & use of spices
Chemical constituents of spices.
Processing of white pepper.
Dehydration products of onion, garlic.

UNIT-II

Cryomilling of spices.
Spice oleoresins and spice emulsion.
Packaging of spices and spice products.
Microbial contamination and insect infestation in spices and its control.

UNIT-III

Classification of flavouring compounds.
Processing of Cocoa and Coffee.
Stability of flavourings.

Practicals:

1. Determination of moisture in ground spices.
2. Determination of total ash in spices.
3. Determination of extraneous matter in spices.
4. Determination of pungency rating (Scoville method) in Red Pepper.
5. Adulteration tests for different spices.
6. Organoleptic evaluation of flavours.
7. Identification of Saffron by sulphuric – diphenylamine test.

Recommended Books:

1. Handbook of Spices by Peter K.V.2001, Woodhead Publishers, UK.
2. Spices and Condiments by Pruthi, J.S., 1976, NBT India.
3. Spice Statistics by Spices Board 2007, GOI, Cochin.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VI

(FST – 605 TECHNOLOGY OF FERMENTED FOODS)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical:– Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT -I

Introduction: Concept of fermented foods, Scope & development in fermented foods & beverage industry. Benefits of fermented foods,

Fermented milk products :

Curd, Yoghurt, Acidophilic milk, Bulgarian milk, Koumiss and Kefir

UNIT-II

Legume products :

soy sauce, miso, tempeh, idli,

Fruit and Vegetable products:

Sauerkraut, Kimchi, Cucumber pickles,

UNIT-III

Meat products:

Fermented meat sausages.

Alcoholic beverages:

Beer, wine, vinegar,

Practicals :

Preparation of following fermented foods in the laboratory and study their spoilage:

Sauerkraut, Pickles, Cheese, Yoghurt

Idli, Fruit Wine, Dosa

Recommended Books:

1. Industrial-Microbiology by Prescott & Dunn
2. Indigenous fermented foods by Steinkraus

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VI

(FST – 606 IN PLANT TRAINING 4 WEEKS)

Time: 4 WEEKS

Satisfactory/US

All the students are required to undergo 'In Plant Training' for 4 weeks in a food processing unit after 6th semester's final examinations.

Final degree to the students will be awarded subject to their successfully completing the 'In Plant Training'.

In Plant Training will be evaluated as satisfactory / unsatisfactory internally by the department of the college concerned.

Last date for submission of Training Report: within 1 week after coming from training.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VII

(FST – 701 FOOD SAFETY & FOOD LAWS)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I****INTRODUCTION TO FOOD SAFETY**

Definition, Historical background of food safety, Factors affecting Food Safety, Importance of Safe Foods.

UNIT-II**FOOD HAZARDS OF PHYSICAL, CHEMICAL AND BIOLOGICAL ORIGIN**

Introduction, Physical Hazards with common examples, Chemical Hazards (naturally occurring environmental and intentionally added and contaminants due to processing), Seafood and Shell fish poisoning, Microbiological hazards (Bacterial and Fungal).

UNIT-III**FOOD SAFETY MANAGEMENT TOOLS**

Prerequisites of food hygiene- GHPs ,GMPs, HACCP, TQM - concept and need for quality, Microbiological tests for food safety related to (*Coliforms, Listeria, Staphylococci and Salmonella*) , definition and principles of risk Analysis. Steps involved in implementation of food safety programme.

Food safety laws and regulations (FSSAI). New approaches to food safety.

Practicals

1. Detection and estimation of food additives and adulterants.
2. Preparation of HACCP charts for meat industry.
3. Preparation of HACCP charts for dairy industry.
4. Preparation of HACCP charts for fruits and vegetable industry.
5. Preparation of HACCP charts for cereal industry.
6. Analysis of aflatoxins in fungal contaminated food product.
7. Visit to Food Industries.

Recommended Books:

Adam MR and Moss MO Food microbiology New Age International (P) Ltd. ND

Jay JM Modern Food Microbiology CBS publishers ND

Potter NN Food Science CBS Publishers ND

Bhunja AK Food borne Microbial Pathogens (Mechanism and Pathogenesis) Food Science text series Springer

Food Safety by Ian C Shaw: Publisher Wiley Blackwell

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VII**(FST – 702 INDUSTRIAL MICROBIOLOGY)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:****Theory: – Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.****Practical: – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.****Theory:****UNIT -I**

Introduction, Scope and Historical development of industrial microbiology, Methods of Isolation, Screening, improvement & maintenance of industrially important microorganisms,

UNIT -II

Scale up of fermentations, Different types of industrial fermentors, Substrates for industrial fermentation, Principles and Production of citric acid, lactic acid, amino acids, alcohol for fuel, Single cell protein, enzymes (general) and vitamins (Riboflavin, carotenes and B₁₂),

UNIT -III

Utilization of cheap agricultural by-products/wastes for industrial fermentation, Downstream processing: Centrifugation, filtration, precipitation, extraction, drying, cell disruption

Practicals:

- Isolation of amylolytic microorganisms from a source
- Isolation of cellulolytic microorganism from soil
- Maintenance of industrial microorganisms by various methods
- Production of lactic acid in the laboratory
- Production of ethanol in the laboratory
- Determination of alcohol strength by potassium dichromate method
- Alcohol determination by specific gravity method

Recommended Books:

- 1 Industrial-Microbiology by Prescott & Dunn
- 2 Industrial Microbiology by Casida
3. Principles of Fermentation technology by Stanbury and Whittaker
4. Biotechnology: Food Fermentation by VK Joshi & Ashok Pandey
5. Biotechnology: Food Fermentation by VK Joshi & Ashok Pandey

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VII**(FST – 703 OIL & FAT TECHNOLOGY-II)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:**

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT-I**

1. Refining: degumming, choice of alkali, batch and continuous refining,
2. Bleaching: choice of adsorbent, batch and continuous bleaching.
3. Deodorization: process parameters : batch and continuous processing

UNIT-II

4. Hydrogenation of oils: mechanism, process parameters and batch processing.
5. Fractionation and winterization of oils.
6. Alternative processing methods: PCT (physical cleaning techniques)

UNIT-III

7. Manufacture of margarine, shortenings, salad dressings & mayonnaise.
8. Quality assessment tests for fats and oils.
9. Packing and storage of fats and oils.
10. Functions of oils and fats in foods processing: Frying, Cooking, Baking.
11. By products of oil processing: soap and lecithin

Practicals:

1. Detection of sesame oil in vanaspati by furfural test.
2. To determine fat, moisture and salt content of margarine and butter.
3. To carry out refining and bleaching of oil in lab
4. To estimate colour of oil.
5. To determine phospholipid content of oils.
6. To perform melting point, SFI on shortenings

Recommended Books:

- Food Chemistry by Meyer LH, 2006, CBS Publisher, New Delhi
- Food Science by Potter NN, 5th Ed, 2006, CBS Publisher, New Delhi
- Food Oils & Fats: Technology, Utilization and Nutrition by Lawson H, 1995, CBS Publisher, New Delhi.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VII**(FST – 704 FOOD ENGINEERING-I)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:**

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

THEORY:**UNIT-I**

UNITS AND MEASUREMENTS: Brief introduction to dimensions, fundamental units and derived units. Systems of measurement-fps, cgs, mks, SI units.

DEHYDRATION: Moisture-dry and wet basis, free and bound, critical moisture content and equilibrium moisture content, drying theory and drying rate curves, drying time, mechanical drying by using tray dryer, conveyer dryer, rotary dryer, drum dryer, fluidized bed dryer, spray dryer, vacuum dryer, and freeze dryer.

PSYCHROMETRY: Psychrometric properties and psychrometric chart Determination of humidity, relative humidity, dry bulb temperature, wet bulb temperature and dew point.

UNIT-II

PRINCIPLES OF HEAT TRANSFER: Steady and unsteady heat transfer.

Conductive heat transfer-Fourier's law, thermal conductivity, conduction through rectangular slab, hollow cylinder, spherical shell, composite rectangular wall (series), and composite cylinder.

Convective heat transfer-convective heat transfer coefficient, free and forced convection, overall heat transfer coefficient. Radiative heat transfer-StefenBoltzman law, Radiative heat transfer in two objects

HEAT EXCHANGERS: Steam injection and steam infusion.

Tubular, scrapped surface, plate heat, shell and tube heat exchangers.

UNIT-III

EVAPORATION: Parts of evaporator, single effect and multiple effect evaporator, different types of evaporators, steam economy, design of evaporator, thermal and mechanical vapor recompression system.

FILTRATION: Introduction, filtration theory, types of filtration, filtration equipments-pressure filters and vacuum filter.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VII

(FST – 704 FOOD ENGINEERING-I)

Practicals:

- Study of psychometric chart-use and applications.
- Determination of moisture content on wet and dry basis
- Study of dehydration characteristics of different food materials.
- To determine the EMC of a food product.
- To study the working principle of an evaporator.
- Determination of thermal conductivity of a food.
- To study the different modes of heat transfer in foods.
- Shelf life evaluation of a food product.

Recommended books:

- Fundamentals of food engineering by Radha CharanVerma, Sanjay Kumar Jain-Himanshu Publicatios.
- Fundamentals of food processing engineering by Romeo T Taledo, CBS Publications.
- Introduction to food engineering by R Paul Singh and Dennis R Heldman-Academic press London
- Unit operations of chemical engineering by Mccab and Smith, Mcgraw Hill, New Delhi.
- Unit operations of Agriculture Processing by K M Sahay and K K Singh, Vikas Publishers.
- Experimental Methods in food engineering by Rizvi and Mittal, CBS Publishers

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VII**(FST – 705 MALTING & BREWING TECHNOLOGY)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:**

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:**UNIT – I**

Composition and structure of barley, Preparation and storage of barley for malting Characteristics of barley for malting, Malting operations : Steeping, germination, kilning and modification, Composition of malt.

UNIT – II

Brewing operations, Grinding, Mashing : changes during mashing, Filtration of wort Sparging and boiling, changes during boiling, Hops, selection of hops, Acidification of mash, Wort cooling.

UNIT – III

Beer manufacturing, Wort production, Fermentation, Pasteurization, Types and characteristics of beer.

Practicals:

1. Determination of moisture content of barley.
2. To determine the seed germination capacity of barley.
3. Determination of % protein content of barley.
4. Determination of amount of husk in barley.
5. Preparation of malt.
6. To determine the length of acrospires.
7. Determination of Total Soluble Solids and Total Solids of malt.
8. Determination of % reducing sugars in malt.

Recommended Books:

1. Malting and Brewing Science Vol. I: Lewis and Young (1981).
2. Malting and Brewing Science Vol. II: Lewis and Young (1982).

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII

(FST – 801 FOOD BIOTECHNOLOGY)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

UNIT-I

Introduction:

Components of Molecular Biotechnology, Recombinant DNA Technology, Restriction Endonucleases, Cloning Vectors, Polymerase Chain Reaction, Ligase chain reaction

UNIT-II

Applications of Food Biotechnology:

Plant Biotechnology for Food Production, Improvement of Plant Nutritional and Functional Quality, Plant Proteins, Lipids, Saturated Fatty Acids, Unsaturated Fatty Acids, Carbohydrates, Plant Vaccines, Milk Proteins, Reconstitution of Human Milk Proteins in Food Plants, Carotenoids, Vitamins, Minerals, Manipulation of Fruit Ripening,

UNIT-III

Genetic Modification of microorganisms and crops:

Genetically modified crops for food production, Future trend of GM crops, Food ingredients, processing aids, dietary supplements derived from GM microorganisms, Risk of GMOs and GM Foods to Human Health and Environment

Practicals:

Isolation of DNA from micro-organisms.
Isolation of RNA from yeast cells.
Colorimetric estimation of DNA.
Colorimetric estimation of RNA.
Demonstration of PCR.
Demonstration of tissue culturing in Lab.
Digestion of DNA by Restriction Endonucleases
Making & Selection of competent E. coli

Recommended Books:

1. Lopez G.F.G and Canovas G.V.B. Food Science and Food biotechnology CRC press
2. Fundamentals of Food Biotechnology by Byong H. Lee: Wiley VCH
3. Tripathy S. N. Food Biotechnology Dominant Publishers and distributors ND
Singh R.P. Biotechnology Central Book depot Allahabad

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII

(FST – 802 ENZYMES IN FOOD PROCESSING)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:-

UNIT I

Enzymes– classification, properties and mechanism of enzyme action.

Enzymes for production of maltodextrins and corn syrup solids (liquefaction, saccharification, dextrinization, isomerization for production of high-fructose-corn-syrup).

UNIT II

Enzymes in dairy industry: natural enzymes in milk, lactose intolerance, Role of enzymes in cheese making and whey processing.

Fruit juices: Cell wall degrading enzymes for liquefaction, clarification, debittering and decolourization

Immobilized enzyme technology.

UNIT III

Baking: fungal α -amylase for bread making; maltogenic α -amylases for anti-staling; lipases as dough conditioners.

Meat and meat processing : meat tenderization; egg processing.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII

(FST – 802 ENZYMES IN FOOD PROCESSING)

Practicals:

1. To study the effect of temperature on enzyme activity.
2. To study the effect of substrate concentration on enzyme activity.
3. Determination of enzyme activity of α -amylase in starch hydrolysis.
4. Determination of lipase activity of lipids.
5. To demonstrate the effects of papain enzymes in meat tenderization.
6. Determination of catalase activity of hydrogen peroxide production.
7. Determination of oxidase activity of given sample.
8. Clarification of juices using enzymes.
9. To determine the adequacy of pasteurization in milk.

Books Recommended:

Flickinger MC & Drew SW. 1999. Encyclopedia of Bioprocess Technology. A Wiley- Inter Science Publ.

Kruger JE. et al. 1987. Enzymes and their Role in Cereal Technology. American Association of Cereal Chemists Inc.

Nagodawithana T & Reed G. 1993. Enzymes in Food Processing. Academic Press.

Tucker GA & Woods LFJ. 1991. Enzymes in Food Processing.

Whitehurst R & Law B. 2002. Enzymes in Food Technology. Blackwell Publ.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII

(FST – 803 FOOD ENGINEERING -II)

Time: 3 Hours

**Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16**

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:-

UNIT-I

REFRIGERATION : Components of Refrigeration system, refrigeration cycle and refrigeration load, primary and secondary refrigerants.

FREEZING: Direct and indirect contact freezing, freezing time calculation.

UNIT-II

FLUID FLOW: Properties of fluid- density, pressure, surface tension and viscosity.

Newtonian and non Newtonian fluids, laminar and turbulent fluid, Reynold's number,

Equation of continuity, Bernoulli's theorem, Poiseuille's equation-viscosity measurement in tube, manometer, flow measuring devices-Pitot tube, Venturimeter, orifice meter.

PUMPS: Definition, classification, positive displacement and centrifugal pumps, factors affecting choice of a pump.

UNIT-III

SIZE REDUCTION: Definition and requirements of size reduction, forces used in size reduction, equipments for size reduction-crushing rolls, hammer mill, disc attrition mill, buhr mill, tumbling mill- ball and rod mill. Critical speed in a tumbling mill. Modes of operation, energy requirements for comminution of solids- Rittenger's law, Kick's law and Bond's law.

SCREENING: Types of screens-grizzly, trammels, vibrating screens, screen openings, and aperture, perforated metal screens and wire mesh screens, factors affecting screening.

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII

(FST – 803 FOOD ENGINEERING -II)

Practicals:

- To calculate the refrigeration load in cold storage plant.
- To determine the freezing time of a food.
- Determination of relative viscosity of a liquid food.
- Determination of coefficient of viscosity.
- Determination of pressure drop by using manometer.
- Determination of flow rate of a liquid.
- To study the working principle and operation of a hammer mill.
- To study the working principle and operation of a ball mill.
- Determination of particle size of given flour sample using Sieve analysis.

Recommended books:

- Fundamentals of food engineering by Radha CharanVerma, Sanjay Kumar Jain- Himanshu Publicatios.
- Fundamentals of food processing engineering by Romeo T Taledo, CBS Publications.
- Introduction to food engineering by R Paul Singh and Dennis R Heldman- Academic press London, UK.
- Unit operations of chemical engineering by Mccab and Smith, Mcgraw Hill, New Delhi.
- Unit operations of Agriculture Processing by K M Sahay and K K Singh, Vikas Publishers.
- Experimental Methods in food engineering by Rizvi and Mittal, CBS Publishers

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII

(FST – 804 FOOD PLANT LAYOUT)

Time: 3 Hours

Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16

Instructions for the Paper Setters:

Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.

Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.

Theory:

UNIT-I

Plant design concepts and general design considerations;

Plant location - location factors and their interaction with plant location, Importance of a plant layout selection of site and layouts of different food industries.

UNIT-II

Selection of building material, selection and planning of manufacturing process and service facilities. Process selection; process flow charts, selection of equipment and machinery; maintenance and replacement, depreciation of machinery.

UNIT-III

Management set up in a plant. Plant layout, layout symbols.

Practicals:

- Preparation of layout and process diagram of potato crisp manufacturing plant.
- Preparation of layout and process diagram of Jam/Marmalade manufacturing plant.
- Preparation of layout and process diagram of Bread making plant.
- Preparation of layout and process diagram of a dairy industry.
- Preparation of layout and process diagram of wine making unit.
- Preparation of layout and process diagram of a modern slaughter house.
- Preparation of layout and process of diagram of a confectionary unit.
- Calculation of depreciation of machinery and processing costs.

Recommended Books:

1. Principle of Food Sanitation by Marriott, 5th Ed., 2006, CBS Publishers, New Delhi.
2. Food Processing Waste Management by Green JH and Kramer A, 1979, AVI Publishers, USA.
3. Food Science by Potter NN, 5th Ed., 2006, CBS Publishers, New Delhi.
4. Plant layout and material handling by Sharma S.C.
5. Plant layout & design by James Moore

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BACHELOR OF FOOD SCIENCE & TECHNOLOGY (HONS.) - SEMESTER - VIII**(FST – 805 FOOD ANALYSIS & INSTRUMENTATION)****Time: 3 Hours****Max. Marks: 80
Theory Marks: 40
Practical Marks: 24
Internal Marks: 16****Instructions for the Paper Setters:****Theory:– Question paper will contain eight questions in all and students will be asked to attempt any five questions. Each question will carry equal marks.****Practical – Question Paper will be set with the mutual consent of Internal and External Examiners at the spot.****Theory:****UNIT I**

Brief introduction and principles: Spectroscopic techniques using UV/Visible, polarimetry, refractometry, microscopic techniques in food analysis (light microscopy).

Electron microscopy: principle and brief introduction to types of electron microscopy (SEM, TEM): application of electron microscopy in food processing.

UNIT II

Principle and working of Column chromatography, Gas chromatography and High Pressure Liquid Chromatography.

Brief introduction and principles to Separation techniques: ultrafiltration and supercritical fluid extraction.

UNIT III

Brief introduction and principles to Special techniques: surface tension; thermal methods in food analysis (Differential scanning calorimetry). Texture analyzer, rheometer, hunterlab, amylograph and farinograph, calorimeter.

Practicals:

1. Sorption isotherms by measuring water activity in any hygroscopic food material (for instance - biscuits/potato chips/coffee powder).
2. Estimation of tannin/phytic acid/ pigments by spectrometric method.
3. Separation of amino acids/coal tar dyes by two dimensional paper chromatography.
4. Separation and identification of carotenoids by column chromatography.
5. Analysis of dietary fibre/glucose by enzymatic method.
6. Demonstration of instruments : GLC, HPLC, Atomic absorption, Flame photometer, Farinograph, UV-Vis spectrophotometer and microscopes.

Recommended Books:

AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.

Kirk RS & Sawyer R. 1991. Pearson's Chemical Analysis of Foods. 9th Ed. Longman Scientific & Technical.

Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett.

Pomrenz Y & Meloan CE. 1996. Food Analysis - Theory and Practice. 3rd Ed. CBS.

Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.

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