# Maharaja Ranjit Singh Punjab Technical University
## Dabwali Road, Bathinda -151001
### (Estb. under Act 5(2015) of Punjab Govt & under section 2 (f) & 12 (b) of the UGC Act of 1956)

## Department of Physics
### hodphysics@mrsptu.ac.in (Ph. 87250-72488)

Ref No : Phy/21/ 2616                                    Dated 27/08/21

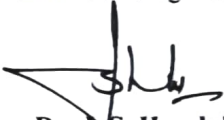## SUBJECT: 4th MEETING OF FACULTY OF SCIENCES TO BE HELD ON 02.09.2021

To

| | | |
|---|---|---|
| 1. | **DR O.P. PANDEY**<br>Sr. Prof. & Head, School of Physics and Material Science,<br>Thapar IET, Patiala<br>(98884-01777) oppandey@thapar.edu | Chairperson |
| 2. | **DR JASBIR SINGH HUNDAL**<br>Head, Department of Physics<br>MRSPTU, Bathinda<br>(94634-03250) jshundal@yahoo.com | Member Secretary |
| 3. | **DR KARANVIR SINGH**<br>Head, Department of Mathematics<br>MRSPTU, Bathinda<br>(88722-11150) karanvirs786@gmail.com | Member |
| 4. | **DR SEEMA SHARMA**<br>Head, Department of Chemistry,<br>MRSPTU, Bathinda<br>(94171-14169) harprit6920@gmail.com | Member |
| 5. | **PROF SANJAY BHATNAGAR**<br>Head, Deptt of Computational Sciences,<br>MRSPTU, Bathinda<br>(87250-72319) hodcc.gzsccet@gmail.com | Member |
| 6. | **DR DR KAWALJIT SINGH SANDHU**<br>Head, Deptt of Food Science & Technology<br>MRSPTU, Bathinda<br>(70157-09403) kawsandhu@rediffmail.com | Member |
| 7. | **Dr Sandeep Kansal**<br>Department of Physics, MRSPTU, Bathinda<br>(98720-00814) skansal@mrsptu.ac.in | Member |
| 8. | **Dr Yogeshwar Chauhan**<br>Deptt of Physics, Asra College of Engg,<br>(95928-00327) asraacetdirector@gmail.com | Member |
| 9. | **Dr Manish Gupta**<br>Deptt of Mathematics, Baba Farid CET, Bti<br>(95011-15418) manishgupta.bti@ gmail.com | Member |
| 10. | **Prof Mamta Kansal**<br>Deptt of Mathematics, MRSPTU, Bathinda<br>(88722-11700) mamtakansal2k8@yahoo.com | Member |
| 11. | **Dr Munish Kumar**<br>Deptt of Computational Sc, MRSPTU, Bti<br>(98723-19157) munishcse@gmail.com | Member |
| 12. | **Dr Veena Sharma**<br>Deptt. of Physics, MRSPTU, Bathinda<br>(97816-01059) vn.veena@gmail.com | Member |
| 13. | **Dr Devinder Mehta**<br>Professor, Department of Physics<br>Punjab University, Chandigarh<br>(98159-73101) dmehta@pu.ac.in | Member |
| 14. | **Dr Pritpal Singh Dhillon**<br>Professor, Department of Chemistry<br>Sri Guru Granth Sahib World Univ, F'Sahib<br>(84270-00415) dhillonps2003@gmail.com | Member |

| 15. | **Dr Kawaljeet Singh**<br>Professor & Director Univ Computer Centre<br>Punjabi University, Patiala<br>(99150-99577) singhkawaljeet@pbi.ac.in | Member |
| 16. | **Dr Satya Bir Singh**<br>Professor, Deptt of Mathematics,<br>Punjabi University, Patiala<br>(98722-11695) sbsingh69@yahoo.com | Member |
| 17. | **Dr Vikas Nanda**<br>Professor, Deptt of Food Engg & Tech,<br>Sant Longowal Inst of Engg & Tech, Sangrur<br>(98159-80054) vikasnanda@sliet.ac.in | Member |
| 18. | **Dr. Poonam Aggarwal Thakur**<br>Principal,<br>Northern India Institute of Fashion Technology, Mohali<br>(Ph. 0172-5044994, 9417303649)<br>principal@niiftindia.co, thakur10poonam@yahoo.co.in | Special Invitee |

Sir/Madam,

It is to inform you that 4TH Meeting (online) of Faculty of Sciences of Maharaja Ranjit Singh Punjab Technical University has been scheduled on 02/09/2021 at 11.00 AM. You are requested to make it convenient to attend this meeting. The detailed agenda shall be sent to you soon.

Dr. Satnam Singh, Assistant Professor, Department of Physics shall be the coordinator of the meeting. He may be contacted at M: +91-7986595372, E-mail:satnam@mrsptu.ac.in.

Dr. J.S. Hundal
Member Secretary,
Faculty of Sciences,
MRSPTU, Bathinda

**NOTE:** *Keeping in view the prevailing conditions due to COVID-19, on-line meeting through Google hangsout will also be arranged for the members which are from far-off places and the Link for the same will be shared on the same day about half an hour before the start of the meeting. It will be beneficial if the local members from the college can attend the meeting in person, but if there is any unavoidable situation due to COVID-19, they may attend it online also.*

**Copy to:**
1. PA to Vice Chancellor, MRSPTU, Bathinda for information to Vice Chancellor please.
2. Registrar, MRSPTU, Bathinda
3. Professor I/C, Finance, MRSPTU, Bathinda
4. Dean Academic Affairs, MRSPTU, Bathinda
5. Director ITES

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਤਕਨੀਕੀ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ

ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ - 151001

## Maharaja Ranjit Singh Punjab Technical University
DABWALI ROAD, BATHINDA-151001

[A State University Estb. by Govt. of Punjab Act No. 5(2015) u/s 2(f) & Approved u/s 12B of UGC Act, 1956]

ਡੀਨ (ਅਕਾਦਮਿਕ ਮਾਮਲੇ)                                    DEAN(Academic Affairs)

Ref. No.: DAA/MRSPTU/2021/ 3392                         Date: 25. 08. 2021

To

Dr. J. S. Hundal
Member Secretary,
Faculty of Sciences,
MRSPTU Bathinda.

**Subject: Regarding convene a meeting of 4<sup>th</sup> Faculty of Sciences**

Kindly convene meeting of Faculty of Sciences in the capacity of its member secretary (being the senior most HoD) as the syllabi prepared by concerned Board of Studies, need to be approved by Faculty of Sciences before taken up at the Academic Council level.

The proceedings/ minutes of the same may be sent to this office upto 03 September, 2021.
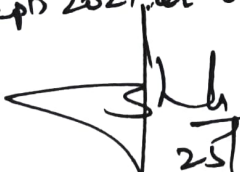
**Encl.:**
1. Draft agenda attached.

Dean Academic Affairs,
MRSPTU, Bathinda

**Copy to:**
1. PA to Vice Chancellor for kind information.

URGENT

Pl. discuss & plan to schedule the meeting on line mode on wednesday, 01st Sept 2021, or 02nd Sept, 2021

25/08/2021

Dr. Satnam Singh
I/c Academics

**ITEM NO. 04.01**  **TO APPROVE THE MINUTES OF MEETING OF BOARD OF STUDIES IN COMPUTATIONAL SCIENCES HELD ON 09.04.2021 & 29.04.2021**

The minutes of meeting of Board of Studies in Computational Sciences held on 09.04.2021 & 29.04.2021 are attached herewith **ANNEXURE-I (Page 1-7)**.

*Put up before Faculty of Sciences for deliberations and approval for further recommending it to Academic Council please.*

**ITEM NO. 04.02**  **TO APPROVE THE MINUTES OF MEETING OF BOARD OF STUDIES IN FOOD SCIENCE & TECHNOLOGY HELD ON 06.05.2021**

The minutes of meeting of Board of Studies in Food Science & Technology held on 06.05.2021 are attached herewith **ANNEXURE-II (Page 8)**.

*Put up before Faculty of Sciences for deliberations and approval for further recommending it to Academic Council please.*

**ITEM NO. 04.03**  **TO APPROVE THE SYLLABUS OF INTEGRATED / DUAL DEGREE BCA-MCA FOR 2018 AND 2019 BATCH FROM 7<sup>TH</sup> TO 10<sup>TH</sup> SEMESTER**

As per the comments received from Chairperson, BOS in Computational Sciences, the syllabi of Integrated / Dual Degree BCA-MCA for 2018 & 2019 batch are same from Semester 7<sup>th</sup> to 10<sup>th</sup> **ANNEXURE-III (Page 9)**.

*Put up before Faculty of Sciences for deliberations and approval for further recommending it to Academic Council please.*

**ITEM NO. 04.04**  **TO APPROVE THE COURSE OBJECTIVES & EXPECTED OUTCOMES OF INTEGRATED / DUAL DEGREE BCA-MCA FOR 2019 BATCH ONWARDS FROM 1<sup>ST</sup> TO 6<sup>TH</sup> SEMESTER**

The course objectives & expected outcomes of Integrated/ Dual Degree BCA-MCA for 2019 batch onwards from 1<sup>st</sup> to 6<sup>th</sup> semester, received from concerned Board of Studies **ANNEXURE-IV (Page 10-23)**.

*Put up before Faculty of Sciences for deliberations and approval for further recommending it to Academic Council please.*

**ITEM NO. 04.05** **TO APPROVE THE GUIDELINES FOR DISSERTATION WORK IN M.SC FASHION TECHNOLOGY**

As per the comments received from Chairperson, BOS Fashion Technology, the guidelines issued for master thesis in Physics can be referred **ANNEXURE-V (Page 24-25)**.

*Put up before Faculty of Sciences for deliberations and approval for further recommending it to Academic Council please.*
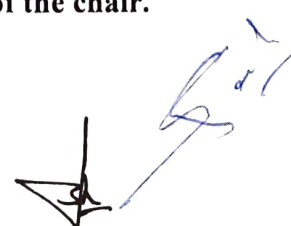
**ITEM NO. 04.06** **APPROVAL OF SYLLABI OF UG/PG PROGRAMMES IN SCIENCES**

Syllabi of following UG/PG Programmes have been prepared by the concerned Board of Studies as per following details: **ANNEXURE-VI (Page 26-167)**

| S. No. | ITEM | Pages |
|---|---|---|
| 1. | Scheme and Syllabus of B. Sc. (Food Science & Technology)/ B.F.S.T. (Hons.) $5^{th}$ – $6^{th}$ Sem. 2019 Batch onwards | 26-49 |
| 2. | Scheme and Syllabus of B. Sc. (Food Science & Technology)/ B.F.S.T. (Hons.) $1^{st}$ – $2^{nd}$ Sem. 2021 Batch onwards | 50-66 |
| 3. | Scheme and Syllabus of M. Sc. (Food Science & Technology) 2021 Batch onwards | 67-103 |
| 4. | Syllabus of B. Sc. (Hons.) Mathematics $5^{th}$ – $6^{th}$ Sem. 2019 Batch onwards | 104-113 |
| 5. | Integrated/ Dual Degree BCA-MCA $7^{th}$ – $10^{th}$ Sem. 2018 & 2019 Batch onwards | 114-136 |
| 6. | Scheme and Syllabus of B. Sc. (Graphics & Web Designing) $1^{st}$ – $4^{th}$ Sem. 2021 Batch onwards | 137-167 |

*Put up before Faculty of Sciences for deliberations and approval for further recommending it to Academic Council please.*

**ITEM NO. 04.07** **Any other agenda Item/Items with the permission of the chair.**

**Maharaja Ranjit Singh**

**Punjab Technical University**

Badal Road, Bathinda-151001, Punjab (INDIA)

**Department of Computational Sciences**

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ

ਪੰਜਾਬ ਤਕਨੀਕੀ ਯੂਨੀਵਰਸਿਟੀ,

ਬਾਦਲ ਰੋਡ, ਬਠਿੰਡਾ 151001) ਪੰਜਾਬ (ਭਾਰਤ)

ਕੰਪਿਊਟੇਸ਼ਨਲ ਸਾਇੰਸਜ ਵਿਭਾਗ

*(Established by Govt. of Punjab vide Punjab Act No. 5 of 2)*

Ref. No:MRSPTU/ CS./21/:_____          Dated: _____

## Minutes of Meeting

A 10th BOS meeting was held (through online mode) on 09-04-2021 at 10:30 AM. The following members were present:

1. Prof. Sanjay Bhatnagar, (Head, Department of Computational Sciences,MRSPTU, Bathinda) (Chairman)
2. Dr. Vishal Goyal (Professor, Deptt. of Computer Science, Punjabi University, Patiala)
3. Dr. Krishan Saluja (Professor, Deptt. of Information Technology UIET, Punjab University Chandigarh)
4. Dr. Amandeep Kaur (Professor, School of Engg.and Tech, Central University of Punjab, Bathinda)
5. Dr. Munish Kumar, (Assistant Professor, Deptt. of Computational Sciences, MRSPTU, Bathinda)
6. Dr. Anju Sharma ( Assistant Professor, PIT, Rajpura )
7. Dr. Deepak Kumar, (Bharat Group of Colleges, Sardulgarh)
8. Mr. Vivek Prajapati, (CEO, Iron Network, Mohali)
9. Dr. Amitoj Singh, (Assistant Professor, Jagat Guru Nanak Dev Punjab State Open University, Patiala)

The following syllabus and ordinances are approved by the members of BOS:-

1). **In regards to the proposal of CDC, MRSPTU**

The proposal in regards to equivalence of 1st year of BCA to certificate and 2nd year to Diploma as requested through CDC is deliberate & it is resolved that it may be taken, once the new education policy is implemented in this regards

2). **In regards to finalization of Scheme & syllabus of BCA-MCA Dual Degree & MCA Degree**

The scheme & syllabus of BCA-MCA Dual Degree is finalised and approved and is placed at Annexure - I. The modified scheme and syllabus of MCA 2 year course is finalized in regards to Bridge Course. The same must be affected with retrospective effect that it should be applicable to the students admitted in the 2020 batch also. The modified scheme & syllabus is placed at annexure - II.

*e-mail consent attached*

(Dr. Vishal Goyal)

*e-mail consent attached*

(Dr. Krishan Saluja )

*Attended online*

(Dr. Amandeep Kaur)

*e-mail consent attached*

(Dr. Anju Sharma)

*e-mail consent attached.*

(Dr. Deepak Kumar)

*Not able to attend the meeting*

(Dr. Vivek Prajapat)

*e-mail consent attached*

(Dr. Amitoj Singh)

(Dr. Munish Kumar)

(Prof. Sanjay Bhatnagar)

1

# BOS 10th Meeting of Computational Sciences Department

6 messages

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**Head of Department Computational Sciences** <computationalsciences@mrsptu.ac.in>      Wed, Jun 9, 2021 at 10:51 AM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>, "Dr. Munish Jindal"
<munishjindal@mrsptu.ac.in>, "Dr. Amitoj Singh" <amitojsingh@mrsptu.ac.in>, vishal.pup@gmail.com,
k.salujauiet@gmail.com, aman_k2007@hotmail.com, anju sharma <phdanju@gmail.com>, vivekprajapati24@gmail.com,
dr.d.k.mehta81@gmail.com

  Kindly  go the through the BOS meeting  held on 9-04-2021 and sent your positive consent please


Office of Head
Computational Sciences
Maharaja Ranjit Singh Punjab Technical University, Bathinda
Punjab


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  37K

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**anju sharma** <phdanju@gmail.com>      Wed, Jun 9, 2021 at 10:54 AM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>

Ok Sir, I agree.
[Quoted text hidden]

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**********************************

## *Dr. Anju Sharma*

**Assistant Professor,**
**Incharge**
**Punjab State Aeronautical Engineering College, Patiala**
**(Constituent College, Maharaja Ranjit Singh Punjab Technical University Dabwali Road, Bathinda-**
**151001),**


Phone: +91-98889-97297

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**Deepak Mehta** <dr.d.k.mehta81@gmail.com>      Wed, Jun 9, 2021 at 11:00 AM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>

Dear sir
I agreed all the said points
thanking you
Regards
Dr. Deepak Kumar
Associate professor
Guru Kashi University, Bathinda



On Wed, Jun 9, 2021 at 10:51 AM Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>
wrote:
[Quoted text hidden]

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**Dr Krishan Kumar** <k.salujauiet@gmail.com>      Wed, Jun 9, 2021 at 11:01 AM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>

Agreed

On Wed, Jun 9, 2021 at 10:51 AM Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in> wrote:
[Quoted text hidden]

--
Dr. Krishan Kumar
Professor, Information Technology,
University Institute of Engineering & Technology,
Panjab University, Chandigarh
**Linkedin:** https://www.linkedin.com/in/krishan-saluja-b81a7489/
**Mobile No:** +918288012014
**E-mail:** k.saluja@pu.ac.in
**Website:** uiet.puchd.ac.in/
https://pu.irins.org/profile/112980
**Qualification:**
**B.Tech. CSE (NIT, Hamirpur), M.S. (BITS, Pilani), Ph.D. (IIT, Roorkee)**
**Research Credentials:**
**Web of Science: ResearcherID** F-6049-2016
**Orcid:** https://orcid.org/0000-0001-9877-0238
**Scopus:** https://www.scopus.com/authid/detail.uri?authorId=26021294900
**Google Scholar:** https://scholar.google.co.in/citations?user=tTQOc9EAAAAJ&hl=en
**Researchgate:** https://www.researchgate.net/profile/Dr_Krishan_Saluja

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**Dr. Amitoj Singh** <amitojsingh@mrsptu.ac.in>                                    Wed, Jun 9, 2021 at 11:10 AM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>

Respected Sir.
I agree with the MoMs. Please go ahead

On Wed, Jun 9, 2021 at 10:51 AM Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in> wrote:
[Quoted text hidden]

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**Deepak Mehta** <dr.d.k.mehta81@gmail.com>                                         Wed, Jun 9, 2021 at 11:12 AM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>

Subject: For Change the name of affiliation in BoS committee.

Dear Sir,

It is stated that I have been attached with Guru Kashi University, Bathinda for the last 1 year as an Associate Professor in the Computer Science Department, UCCA College. It is requested you, kindly update my affiliation to the current workplace.

I shall be very thankful to you for this act of kindness.

Sincerely,

Dr. Deepak Kumar

On Wed, Jun 9, 2021 at 11:00 AM Deepak Mehta <dr.d.k.mehta81@gmail.com> wrote:
  Dear sir
  I agreed all the said points

3

On Wed, Jun 9, 2021 at 11:00 AM Deepak Mehta <dr.d.k.mehta81@gmail.com> wrote:
Dear sir
I agreed all the said points
thanking you
Regards
Dr. Deepak Kumar
Associate professor
Guru Kashi University, Bathinda


On Wed, Jun 9, 2021 at 10:51 AM Head of Department Computational Sciences
<computationalsciences@mrsptu.ac.in> wrote:
Kindly go the through the BOS meeting held on 9-04-2021 and sent your positive consent please


Office of Head
Computational Sciences
Maharaja Ranjit Singh Punjab Technical University, Bathinda
Punjab

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**Head of Department Computational Sciences** <computationalsciences@mrsptu.ac.in>Tue, Jun 15, 2021 at 10:14 AM
To: vishal.pup@gmail.com, aman_k2007@hotmail.com, "Dr. Munish Jindal" <munishjindal@mrsptu.ac.in>

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**Vishal Goyal(विशाल गोयल)** <vishal.pup@gmail.com>                         Tue, Jun 15, 2021 at 12:15 PM
To: Head of Department Computational Sciences <computationalsciences@mrsptu.ac.in>
Cc: Amandeep Kaur <aman_k2007@hotmail.com>, "Dr. Munish Jindal" <munishjindal@mrsptu.ac.in>

I endorse it. Thanks.
[Quoted text hidden]
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**Regards,**
Dr. Vishal Goyal,
Professor,
Department of Computer Science,
State Awardee (Two Times)
Deputy Director, Centre for E-Learning and Teaching Excellence
Coordinator, Research Centre for Technologies Development for Differently Abled Persons
Coordinator, Centre for Research in Artificial Intelligence and Data Science
Coordinator, iHRMS implementation team
Nodal officer, GeM Operations
Nodal Officer, NPTEL Local Chapter
Punjabi University Patiala-147002.
Mobile:+919501096111
Email - vishal.pup@gmail.com,vishal_cs@pbi.ac.in

4

# Maharaja Ranjit Singh
# Punjab Technical University
**Badal Road, Bathinda-151001, Punjab (INDIA)**
## Department of Computational Sciences
*(Established by Govt. of Punjab vide Punjab Act No. 5 of 2)*

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ
ਪੰਜਾਬ ਤਕਨੀਕੀ ਯੂਨੀਵਰਸਿਟੀ,
ਬਾਦਲ ਰੋਡ, ਬਠਿੰਡਾ 151001) ਪੰਜਾਬ (ਭਾਰਤ)
ਕੰਪਿਊਟੇਸ਼ਨਲ ਸਾਇੰਸਜ ਵਿਭਾਗ

Ref. No:MRSPTU/ CS./21/: **7156**     Dated: **30/4/21**

## Mintues of Meeting

Guru Gobind Singh College of Management & Technology, Giddarbaha ਵਿੱਚ  ਨਵੇਂ ਕੋਰਸ B.Sc. (Graphics and Web Designing) ਹਵਾਲਾ ਪੱਤਰ 3809 ਮਿਤੀ 28-04-2021 ਦੇ ਸੰਬੰਧ ਵਿੱਚ ਵਿਭਾਗ ਦੇ ਮੁਖੀ ਦੇ ਦਫ਼ਤਰ ਵਿੱਚ ਮਿਤੀ 29-04-2021 ਸਮਾਂ ਸਵੇਰੇ 10:00 ਵੱਜੇ ਮੀਟਿੰਗ ਰੱਖੀ ਗਈ ਜਿਸ ਵਿੱਚ  ਵਿਭਾਗ ਦੇ ਹੇਠ ਲਿਖੇ ਅਧਿਕਾਰੀ  ਸ਼ਾਮਲ ਹੋਏ:

1. Prof. Sanjay Bhatnagar, Associate Professor.

2. Dr. Munish Kumar, Assistant Professor.

3. Ms. Aanchal Sharma, Lecturer (Lecture Basis)

4. Ms. Manpreet Kaur, Lecturer (Lecture Basis)

5. Ms. Ramandeep Kaur,  Lecturer (Lecture Basis)

ਹੇਠ ਲਿਖੇ **points** ਤੇ ਵਿਚਾਰ ਕੀਤੇ ਗਏ:

**Syllabus:** ਸਿਲੇਬਸ ਦੇ ਸਬੰਧ ਵਿੱਚ  COVID-19 ਦੇ ਚੱਲਦਿਆਂ BoS ਦੀ ਮੀਟਿੰਗ ਹੋਣਾ ਸੰਭਵ ਨਹੀਂ ਹੈ। Guru Gobind Singh College of Management & Technology ਵਿੱਚ  B.Sc. (Graphics and Web Designing) 3 years ਨਵੇਂ ਕੋਰਸ ਦੇ ਸਲੇਬਸ ਨੂੰ IKGPTU  ਦੇ ਸਿਲੇਬਸ ਨੂੰ ਹੀ ਇੱਕ ਵਾਰ ਮੰਨ ਲਿਆ ਜਾਵੇ  ਤਾ ਜੋ ਇਸ ਕਰੋਸ ਨੂੰ ਚਲਾਉਣ ਵਿੱਚ ਕਿਸੇ ਕਿਸਮ ਦੀ ਦਿੱਕਤ ਨਾ ਆ ਸਕੇ ਜੀ

**Eligibility:** B.Sc. (Graphics and Web Designing) 3 years ਕੋਰਸ ਦੀ  Eligibility ਇਸ ਪੱਤਰ ਨਾਲ ਨੱਥੀ ਹੈ ਜੀ।

**Fee Stucture:** FEE Stucture ਬਣਾਉਣ ਦੇ ਲਈ ਇੱਕ ਕਮੇਟੀ ਦਾ ਗਠਨ ਕੀਤਾ ਜਾਵੇ ਜੀ।     1 ̀A ́

**Coding:** ਇਸ ਕੋਰਸ ਦੀ Coding ਡੀਨ ਅਕਾਦਮਿਕ ਮਾਮਲੇ ਵੱਲੋਂ ਕਰਵਾ ਲਿਤੀ ਜਾਵੇ ਜੀ।

28/4/2021
(Prof. Sanjay Bhatnagar)

28/4/2021
(Dr. Munish Kumar)

(Ms. Aanchal Sharma)

(Ms. Manpreet Kaur)

(Ms. Ramandeep Kaur)

(Ms. Mukhinder Kaur)

ਡੀਨ ਅਕਾਦਮਿਕ ਮਾਮਲੇ

Following committee to propose 'A' by 6 5/21.
1. Director-CDC (Chairman)
2. Chairman- BoS (CA)
3. Dr. Munish kr. (Convener)

Encl: Fee structure (BCA / BSc (CS/IT)) of existing courses.

5

**Maharaja Ranjit Singh**

**Punjab Technical University**

adal Road, Bathinda-151001, Punjab (INDIA)

**Department of Computational Sciences**

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ

ਪੰਜਾਬ ਤਕਨੀਕੀ ਯੂਨੀਵਰਸਿਟੀ,

ਬਾਦਲ ਰੋਡ, ਬਠਿੰਡਾ 151001) ਪੰਜਾਬ (ਭਾਰਤ)

ਕੰਪਿਊਟੇਸ਼ਨਲ ਸਾਇੰਸਜ ਵਿਭਾਗ

(*Established by Govt. of Punjab vide Punjab Act No. 5 of 2*)

Ref. No:MRSPTU/ CS./21/:_____        Dated: _____

**B.Sc. In Graphics and Web Designing**

It is an Under Graduate (UG) Program of 3 years duration (6 Semesters)

**Eligibility:**

All those candidate who have passed the 10+2 or its equivalent examination in any stream conduct by a recognized Board/University/Council.

<div align="center">OR</div>

Those candidates who have passed their Matriculation examination and have also passed three year Diploma in any Trade from Punjab State Board of Technical Education & Industrial Training Chandigarh or such Examination from any other recognized State Board of Technical Education, or Longowal Institute of Engineering &Technology, Longowal.

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# Maharaja Ranjit Singh Punjab Technical University
## Dabwali Road, Bathinda -151001
(Estb. by Govt. of Punjab vide Act No. 5 |2015| and u/s 2(f) and 12 B of UGC Act,'1956)

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ।

**Director, College Development Council**

Ref No : _____                                      Dated _____

## Mintues of Meeting

Guru Gobind Singh College of Management & Technology, Giddarbaha ਵਿੱਚ ਨਵੇ ਕੋਰਸ B.Sc

(Graphics and Web Designing) ਦੇ ਸੰਬੰਧ ਵਿੱਚ ਡਾਇਰੈਕਟਰ, ਕਾਲਜ ਡਿਵੈਲਪਮੈਂਟ ਕੋਸਲ ਵਿਭਾਗ ਦੇ

ਦਫ਼ਤਰ ਵਿੱਚ ਮਿਤੀ 06-05-2021 ਸਮਾਂ ਸਵੇਰੇ 9:30 ਵਜੇ ਮੀਟਿੰਗ ਰੱਖੀ ਗਈ ਜਿਸ ਵਿੱਚ ਹੇਠ ਲਿਖੇ ਅਧਿਕਾਰੀ

ਸ਼ਾਮਲ ਹੋਏ:

1. Dr. A. K. Goel, Director, College Development Council, MRSPTU, Bathinda.
2. Prof. Sanjay Bhatnagar, Associate Proferssor.
3. Dr. Munish Kumar, Assistant Professor.

ਮੀਟਿੰਗ ਦੌਰਾਨ ਫੀਸ (fee stucture) ਦੇ ਸਬੰਧ ਵਿੱਚ ਵਿਚਾਰ ਵਟਾਂਦਰਾ ਕੀਤਾ ਗਿਆ ਜਿਸ ਦਾ ਫੀਸ ਵੇਰਵਾ ਹੇਠ

ਲਿਖੇ ਅਨੁਸਾਰ ਪ੍ਰਸਤਾਵ (propose) ਕੀਤਾ ਜਾਂਦਾ ਹੈ:

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **B.Sc (Graphics and Web Designing)** | 1st sem. | 15500 | .... | .... | 3000 | 5350 | 1150 | 1000 | 2000 | ..... | 28000 |
| | 2nd sem. | 15500 | ... | ..... | ..... | 5350 | ..... | 1000 | ..... | ..... | 21850 |
| | 3rd sem. | 15500 | ... | ..... | ..... | 5350 | 550 | 1000 | ..... | ..... | 22400 |
| | 04th sem. | 15500 | ... | ..... | .... | 5350 | ..... | 1000 | ..... | ..... | 21850 |
| | 5th sem. | 15500 | ... | ..... | ..... | 5350 | 550 | 1000 | ..... | ..... | 22400 |
| | 6th sem. | 15500 | ... | ..... | ..... | 5350 | ..... | 1000 | ..... | 500 | 22350 |
| **B.Sc (Lateral Entry)** | 3rd sem. | 15500 | ... | ..... | 3000 | 5350 | 1150 | 1000 | 2000 | ..... | 28000 |
| | 04th sem. | 15500 | ... | ..... | ..... | 5350 | ..... | 1000 | ..... | ..... | 21850 |
| | 5th sem. | 15500 | ... | ..... | ..... | 5350 | 550 | 1000 | ..... | ..... | 22400 |
| | 6th sem. | 15500 | ... | ..... | ..... | 5350 | ..... | 1000 | ..... | 500 | 22350 |

07/5/2021

Director College Development Council
(Chairman)

Prof. Sanjay Bhatnagar
Associate Proferssor

Dr. Munish Kumar
(Convener)

forward to DAA office for na jol

for approval jol.

Website: www.mrsptu.ac.in

Email: dir.cdc@mrsptu.ac.in

Diary Receipt No. 3958
Date 19/05/2021
Dean Academic Affairs
MRSSTU, Bathinda

Receipt No. 3846
Date 27/5/21
Dean Academic Affairs,
MRSSTU, Bathinda

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No.......................                    Dated..............

## Minutes of BOS Meeting

A BOS meeting of the Department of Food Science & Technology was held (via online mode) on dated 06.05.2021 at 4:00 PM. The following members were present.

1. **Dr. Kawaljit Singh Sandhu**
   Head, Department of Food Science and Technology, MRSPTU, Bathinda

2. **Dr. D.C. Saxena**
   Professor, Department of Food Engineering & Technology, SLIET Longowal

3. **Dr. Poonam Aggarwal Sachdev**
   Professor & Head, Department of Food Science & Technology, PAU, Ludhiana

4. **Dr. Maninder Kaur**
   Associate Professor, Department of Food Science and Technology, GNDU, Amritsar

5. **Dr. Jyoti Saroop**
   General Manager, The Unati Co-operative Society, Talwara, Hoshiarpur

6. **Dr. Yashi Srivastava**
   Assistant Professor, Department of Applied Agriculture, CUB, Punjab

7. **Dr. Sanju Godara**
   Assistant Professor, Department of Food Science & Technology, CDLU, Sirsa

After thorough discussions, the following agenda items were approved:-

1. Syllabus of existing B.Sc.-I$^{st}$ and II$^{nd}$ semesters (Food Science and Technology) was discussed and revised.
2. Syllabus of existing M.Sc.-I$^{st}$, II$^{nd}$, III$^{rd}$ and IV$^{th}$ semesters (Food Science and Technology) was discussed and revised.
3. Syllabus of existing Ph.D. (Food Science and Technology) was discussed and revised.
4. The Scheme and syllabus of B.Sc.- V$^{th}$ and VI$^{th}$ semester was discussed and finalized.
5. The BOS also authorized the chairperson of BOS to make minor changes in study scheme and syllabus. If any, the same may be circulated through e-mail to the members. The changes may be ratified in the next BOS meeting.
6. The meeting ended with the vote of thanks to the chair.

(Dr. Sanju Godara)    (Dr. Yashi Srivastava)    (Dr. Jyoti Saroop)    (Dr. Maninder Kaur)

(Dr. Poonam Aggarwal Sachdev)    (Dr. D.C. Saxena)    (Dr. Kawaljit Singh)

# Maharaja Ranjit Singh Punjab Technical University

DABWALI ROAD, BATHINDA-151001

[A State University Estb. by Govt. of Punjab Act No. 5(2015) u/s 2(f) & Approved u/s 12B of UGC Act, 1956]

ਡੀਨ (ਅਕਾਦਮਿਕ ਮਾਮਲੇ)　　　　　　　　　　DEAN (Academic Affairs)

Ref. No.: DAA/MRSPTU/2021/3374　　　　　　Date: 09. 08. 2021

## REMINDER-II

To

**Chairpersons BOS (Civil/ ECE/ Aeronautical & Aerospace/ Pharmaceutical Sciences/ Commerce & Management/ Computational Sciences) MRSPTU, Bathinda**

Sub.: Pending syllabi of 2K18, 2K19 and 2K20 Batches – in regards.

Ref.: DAA/MRSPTU/2021/3297 dated 19.03.2021
　　　DAA/MRSPTU/2021/3341 dated 09.06.2021

Please refer above mentioned letter regarding the subject cited above. As the new session shall begun soon, so kindly expedite the syllabi and schemes pending at your end for **2K18, 2K19 and 2K20** batch students as per the details given below.

| S.No. | Course Name | Batch | Syllabi Pending | Scheme Pending |
|---|---|---|---|---|
| 1. | B. Tech. Civil | 2019 | 5th semester onwards | NIL |
| 2. | B. Tech. ECE | 2018/2019 | 7th semester onwards | NIL |
| 3. | B. Tech. Aeronautical | 2018 | 7th semester onwards | NIL |
| 4. | B. Tech. Aeronautical | 2019 | 5th semester onwards | 5th semester onwards |
| 5. | B. Sc. Optometry | 2020 | 3rd semester onwards | NIL |
| 6. | B. Sc. Operation Theatre Technology | 2020 | 3rd semester onwards | NIL |
| 7. | B. Sc. Radio Medical Imaging Technology | 2020 | 3rd semester onwards | NIL |
| 8. | BBA MBA Integrated | 2020 | 3rd semester onwards | 3rd semester onwards |
| 9. | BBA Aviation Management | 2020 | 3rd semester onwards | 3rd semester onwards |
| 10. | MBA | 2020 | 3rd semester onwards | 3rd semester onwards |
| 11. | BCA-MCA Dual Degree Prog. | 2018 | 7th semester onwards | 7th semester onwards |

Needful in this regard may please be done at the earliest, so that the same may got approved in Faculties meeting.

Dean Academic Affairs,
MRSPTU, Bathinda

Copy to:
1. P.A. to the Vice Chancellor, MRSPTU, Bathinda for information to the Vice Chancellor please

As requested on 18/8/2021

The syllabi of BCA-MCA dual degree for 2018 & 2019 batch are same from Sem 7 to 10

Sjay
18/08/2021

Ref. CS/21/7258
Date: 18/8/21

DAA

for record + file
18/8/21.

Assott. Dean/CDED
Put up the case to agenda of faculty of Science for Approval.
19/08/2021
— CDED.

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# BCA-MCA DUAL DEGREE (5 YRS.) SYLLABUS 2019 BATCH ONWARDS
## (UPDATED ON 09.04.2021)

| Semester 1st | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1-101 | Communicative English | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-102 | Introduction to Information Technology | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-103 | Computer Organization | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-104 | Programming in C Language | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BHUMA0-003 | Human Value & Professional Ethics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-105 | Software Lab.-I (Based on BMCAS1--102) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-106 | Software Lab.-II (Based on BMCAS1--104) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| | Total | 15 | 5 | 8 | 320 | 380 | 700 | 24 |

| Semester 2nd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1 -201 | Database Management System | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -202 | Computer Network | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -203 | Management Information System | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -204 | Object Oriented Programming Language in C++ | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -205 | Operating System | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BMCAS1 -206 | Software Lab.-III (Based on BMCAS1--201) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-207 | Software Lab.-II (Based on BMCAS1-- 204) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| | Total | 15 | 4 | 8 | 320 | 380 | 700 | 23 |

| Semester 3rd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1-301 | Software Engineering | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-302 | Data Structure | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-303 | Fundamentals of Mathematics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-304 | Programming in Java | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BHUMA0-004 | Drug Abuse: Problem, Management and Prevention | 3 | 1 | 0 | 60 | 40 | 100 | 4 |
| BMCAS1-305 | Software Lab.-V (Based on BMCAS1--302) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-306 | Software Lab.-VI (Based on BMCAS1--304) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| Total | | 15 | 5 | 8 | 340 | 360 | 700 | 24 |

| Semester 4th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1-401 | Android Application Development | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -402 | Software Project Management | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-403 | Linux Operating System | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -404 | Discrete Structures | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-405 | Software Lab.-VII (Based on BMCAS1--401) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-406 | Software Lab.-VIII (Based on BMCAS1--403) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| Total | | 12 | 4 | 8 | 280 | 320 | 600 | 20 |

| Semester 5th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1-501 | Latest Trends in IT | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-502 | Artificial Intelligence | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-503 | Object Oriented Analysis and Design using UML | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-504 | Web Application Development | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-505 | Software Lab.-IX (Based on BMCAS1--503) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-506 | Software Lab.-X (Based on BMCAS1--504) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| | Total | 12 | 4 | 8 | 280 | 320 | 600 | 20 |

| Semester 6th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1-601 | Computer Graphics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-602 | Network Security | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-603 | Soft Computing | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-604 | Software Lab- XI (Based on BMCAS1--601) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-605 | Software Lab-XII (Based on BMCAS1--603) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMCAS1-606 | Software Project Development | 0 | 0 | 8 | 60 | 40 | 100 | 4 |
| | Total | 9 | 3 | 16 | 300 | 300 | 600 | 20 |

## COMMUNICATIVE ENGLISH

| Subject Code: BMCAS1-101 | LT PC<br>3 1 0 4 | Durations: 60Hrs. |
| --- | --- | --- |

**Objectives and Expected Outcomes:** The objectives of this course are to make students understand that both oral & written communications are equally important. After completion of this course the students should be comfortable with both verbal & written communications

## INTRODUCTION TO INFORMATION TECHNOLOGY

| Subject Code: BMCAS1--102 | LTPC<br>3 1 0 4 | Durations: 60 Hrs. |
| --- | --- | --- |

**Objectives and Expected Outcomes:** This course will enable the student to gain an understanding of the core concepts and technologies which constitute Information Technology. The intention is for the student to be able to articulate and demonstrate a basic understanding of the fundamental concepts of Information Technology. After completion of this course students should be able to develop and analyze quality computer applications by applying knowledge of software engineering, algorithms, programming, database and networking.

Pursue advanced knowledge and professional development in the field of information technology

## COMPUTER ORGANIZATION

| Subject Code: BMCAS1--103 | LT PC<br>3 1 0 4 | Durations: 60Hrs. |
| --- | --- | --- |

Objectives and Expected Outcomes: This course is intended to teach the basics involved in data representation and digital logic circuits used in the computer system. This includes the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design. This course will also expose students to the basic architecture of processing, memory and I/O organization in a computer system. After completion of this course the students will be able to understand the digital representation of data in a computer system. Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit de

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## PROGRAMMING IN C LANGUAGE

| Subject Code: BMCAS1--104 | L TPC | Duration: 60 Hrs. |
|---|---|---|
| | 3 1 0 4 | |

**Objectives and Expected Outcomes:** The objective of this course is to help the students in finding solutions to various real-life problems and converting the solutions into computer program using C language (structured programming). After completion of this course students will learn to write algorithm for solutions to various real- life problems. Converting the algorithms into computer programs using C language.

## HUMAN VALUES AND PROFESSIONAL ETHICS

| SubjectCode: BHUMA0-003 | LT PC | Durations: 60 Hrs. |
|---|---|---|
| | 3 1 0 4 | |

**Objectives and Expected Outcomes:** To help the students to discriminate between valuable and superficial in the life. To help develop the critical ability to distinguish between essence and form, or between what is of value and what is superficial, in life – this ability is to be developed not for a narrow area or field of study, but for everyday situations in life, covering the widest possible canvas. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. It is not sufficient to develop the discrimination ability; it is important to act on such discrimination in a given situation. Knowingly or unknowingly, our education system has focused on the skill aspects (learning and doing)-it concentrates on providing "How to do" things. The aspects of understanding "What to do" or "Why something should be done" is assumed. No significant cogent material on understanding is included as a part of curriculum. A result of this is the production of graduates who tend to join into a blind race for wealth, position and jobs. Often it leads to misuse of the skills; and confusion and wealth that breeds chaos in family, problems in society, and imbalance in nature. This course encourages students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and superficial in real situations in their life. It has been experimented at IIITH, IITK and UPTU on a large scale with significant results.

After completion of this course the students will be able to evaluate an ethical life and profession ahead.

## SOFTWARE LAB-I (BASED ON BMCAS1--102)

| SubjectCode: BMCAS1--105 | L T PC |
|---|---|
| | 0 0 4 2 |

This laboratory course will comprise an exercise to supplement what is learnt under paper BMCAS1--102 Introduction to Information Technology.

## SOFTWARE LAB-II (BASED ON BMCAS1--104)

**SubjectCode: BMCAS1--106**          L T PC
                                      0 0 4 2

This laboratory course will comprise and exercise to supplement what is learnt under paper BMCAS1—104 to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming).

## DATABASE MANAGEMENT SYSTEM

**SubjectCode:BMCAS1--201**          LT PC                    Durations:60 Hrs.
                                     3 1 0 4

**Objectives and Expected Outcomes:** The objective of this course is to describe a introduction to the discipline of database management system, to give good formal foundation on the data models and to introduce the concept of basic SQL as a Universal database language. After completion of this course students will learn: Will be able to comprehend and evaluate the role of database management systems. Effectively explains the basic concepts of databases and data models. Defines the basics of the relational data model.

## COMPUTER NETWORK

**SubjectCode:BMCAS1--202**          LT PC                    Durations: 60 Hrs.
                                     3 1 04

**Objectives and Expected Outcomes**: The objective of this course is to describe the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model, read the fundamental and basics of all layers and apply them in real time applications.
After completion of this course students will learn: To describe the functions of each layer in OSI and TCP/IP model. To classify the routing protocols and analyze how to assign the IP addresses for the given network. To explain the types of transmission media. Prepare a plan for anti-virus protection.

## MANAGEMENT INFORMATION SYSTEM

**SubjectCode:BMCAS1--203**          LTPC                     Durations: 60 Hrs.
                                     3 1 0 4

**Objectives and Expected Outcomes**: The  main aim of this course is to define data capturing, data storage, retrieval and dissemination. After completion of this course students will be able to: To evaluate the role of information systems in today's competitive business environment. Assess the relationship between the digital firm, electronic commerce, electronic business and internet technology. Identify managerial risks related to information system organization processing and utilizing.

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## OBJECT ORIENTED PROGRAMMING USING C++

SubjectCode:BMCAS1--204      L T P C      Duration:60Hrs.
                        3 1 0 4

**Objectives and Expected Outcomes:** The objectives of the course are to have students identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes and class libraries, arrays, vectors, inheritance, and file I/O stream concepts.
After completion of this course students will be able to: Understand the difference between the top-down and bottom-up approach. Describe the object-oriented programming approach in connection with C++.Apply the concepts of object-oriented programming. Illustrate the process of data file manipulations using C++. Apply virtual and pure virtual function & complex programming situations.

## OPERATING SYSTEM

SubjectCode:BMCAS1--205      LT PC      Durations: 60Hrs.
                        3 10 4

**Objectives and Expected Outcomes**: To make the computer system convenient to use in an efficient manner, to hide the details of the hardware resources from the users and to provide users a convenient interface to use the computer system.
After completion of this course students will be able to: Identify and define key terms related to operating systems. Explain basic concepts related to concurrency and control of concurrent programs. Students have the logical, algorithmic, and mathematical capability to model and analyze real-world problems in different application domains.

## SOFTWARE LAB-IV (BASED ON BMCAS1--201)

SubjectCode:BMCAS1--206      L T P C
                        0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-: 201 Database Management System. Student will be provided with Operational Knowledge and Implementation of Database using SQL.

## SOFTWARE LAB-IV (BASED ON BMCAS1--204)

SubjectCode:BMCAS1--207      L T PC
                        0 04 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-: 204 Object oriented Programming using C++ .Student will be provided with Operational Knowledge and Implementation of numerical methods & statistical Techniques using C++ Language.

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## SOFTWARE ENGINEERING

**SubjectCode:BMCAS1--301**       **L T P C**       **Duration: 60Hrs.**
                                  **3 1 0 4**

**Objectives and Expected Outcomes:** To apply principles of software development and evolution. To specify, abstract, verify, validate, plan, develop and manage large software and learn emerging trends in software engineering.

After completion of this course the students will be able to: Learn the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. Ability to communicate effectively with a range of audiences. Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

## DATA STRUCTURES

**SubjectCode:BMCAS1—302**       **L T P C**       **Duration: 60Hrs.**
                                 **3 1 0 4**

**Objectives and Expected Outcomes:** To impart the basic concepts of data structures and algorithms, to understand concepts about searching and sorting techniques, to understand basic concepts about stacks, queues, lists, trees and graphs 4 To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structure.

After completion of this course students will be able to learn: Develops skills in implementations and applications of data structures. Implements basic algorithms for sorting and searching. Implements basic data structures such as stacks, queues and trees. Applies algorithms and data structures in various real-life software problems.

## FUNDAMENTALS OF MATHEMATICS

**SubjectCode:BMCAS1—303**       **LTPC**       **Duration: 60Hrs.**
                                 **3 104**

**Objectives and Expected Outcomes**: To describe several areas of mathematics, describe several diverse examples of mathematics, Demonstrate the use of mathematical reasoning.

**After completion of this course students will be able to learn:** Understand, analyze and create mathematical arguments. Understand sets, perform operations and algebra on sets, describe sequences and summations.

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## PROGRAMMING IN JAVA

**SubjectCode:BMCAS1-304**          **LTPC**          **Duration: 60Hrs.**
                                    **3 1 0 4**

**Objectives and Expected Outcomes**: To learn how to implement object-oriented designs with Java, to identify Java language components and how they work together in applications and to design and program stand-alone Java applications.

On completion of the course the student should be able to: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.Readand make elementary modifications to Java programs that solve real-world problems, validate input in a Java program.

## DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION

**SubjectCode:BHUMA0--004**          **LTPC**          **Duration: 60Hrs.**
                                     **3 1 0 4**

**Objectives and Expected Outcomes**: Determine the impact of drug use and SUDs on public health outcomes and clarify the impact of drug use and addiction on families and peers.

On completion of the course the student should be able to: Measure the societal costs associated with drug use and addiction

## SOFTWARE LAB V (BASED ON BMCAS1 -302 DATA STRUCTURES)

**SubjectCode:BMCAS1--305**          **L T P C**
                                     **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-: 302 Data Structures

## SOFTWARE LAB VI (BASED ON BMCAS1-304 JAVA PROGRAMMING)

**SubjectCode:BMCAS1--306**          **LTPC**
                                     **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-: -304 Java Programming.

## ANDROID APPLICATION DEVELOPMENT

| SubjectCode:BMCAS1—401 | LTPC | Duration: 60Hrs. |
|---|---|---|
| | 3 104 | |

Objectives and Expected Outcomes: To understand the concepts and techniques used in creating applications and to learn how to create user interfaces for android application.

On completion of the course the student should be able to: Create an android application from the scratch and deploy self- developed applications on android devices.

## SOFTWARE PROJECT MANAGEMENT

| SubjectCode:BMCAS1—402 | LTPC | Duration: 60 Hrs. |
|---|---|---|
| | 3 1 04 | |

**Objectives and Expected Outcomes**: To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices, to explain methods of capturing, specifying, visualizing and analyzing software requirements and to understand need of project management and project management lifecycle.

On completion of the course the student should be able to: Define various software application domains and remember different process model used in software development. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques. Generate project schedule and can construct, design and develop network diagram for different software modules.

## LINUX OPERATING SYSTEM

| SubjectCode:BMCAS1—403 | LTPC | Duration: 60Hrs. |
|---|---|---|
| | 3 10 4 | |

**Objectives and Expected Outcomes**: To introduce Basic Linux general purpose Commands, to learn network Linux commands, to learn shell script and concepts and to learn file management and permission advance commands.

On completion of the course the student should be able to: Identify the basic Linux general purpose commands. Apply and change the ownership and file permissions using advance Linux command Implement shell scripts. Apply basic of administrative task. Apply networking Linux commands.

## DISCRETE MATHEMATICS

| SubjectCode:BMCAS1—404 | L T PC | Duration: 60 Hrs. |
|---|---|---|
| | 3 10 4 | |

**Objectives and Expected Outcomes**: To develop logical thinking and its application to computer science (to emphasize the importance of proving statements correctly and de-emphasize the hand-waving approach towards correctness of an argument). The subject enhances one's ability to reason and ability to

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present a coherent and mathematically accurate argument.

On completion of the course the student should be able to: Write an argument using logical notation and determine if the argument is or is not valid. Understand the basic principles of sets and operations in sets. Prove basic set equalities. Apply counting principles to determine probabilities. Demonstrate different traversal methods for trees and graphs. Model problems in Computer Science using graphs and trees.

## SOFTWARE LAB VII (BASED ON BMCAS1-401 ANDROID APPLICATION DEVELOPMENT)

**SubjectCode:BMCAS1—405**          **LTPC**
                                   **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-:401 Android Application Development.

## SOFTWARE LAB VIII (BASED ON BMCAS1-403 LINUX OPERATING SYSTEM)

**SubjectCode:BMCAS1--406**          **LT PC**
                                    **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-: 403 Linux Operating System. Students are required to develop programs in Linux.

## LATEST TRENDS IN IT

**SubjectCode:BMCAS1—501**          **L T PC**          **Duration: 60 Hrs.**
                                   **3 1 0 4**

**Objectives and Expected Outcomes**: To make aware student the changes in technologies, applications and Systems around us.

After completion of the course the student should be able to:
- Recognize the concepts of emerging technologies.
- Analyze the components of cloud computing.
- Critically analyze case studies to derive the best practice model to apply when developing and deploying parallel, distributed, cloud and IoT based applications.

## ARTIFICIAL INTELLEGENCE

**SubjectCode:BMCAS1—502**          **L T PC**          **Duration: 60 Hrs.**
                                   **3 1 0 4**

**Objectives and Expected Outcomes**: The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.

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After completion of this course the student will be able to understand the: Different types of AI agents. Various AI search algorithms. The fundamentals of knowledge representation.

## OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

**SubjectCode:BMCAS1—503**          **LTPC**          **Duration: 60Hrs.**
                                     **3 10 4**

**Objectives and Expected Outcomes**: Create a requirements model using UML class notations and use-cases based on statements of user requirements, and to analyze requirements models given to them for correctness and quality, Create the OO design of a system from the requirements model in terms of a high-level architecture description, and low-level models of structural organization and dynamic behavior using UML class, object, and sequence diagrams.

After completion of this course the students will be able to learn: Learn the basis of OO analysis and design skills. Learn the UML design diagrams. Learn to map design to code. Be exposed to various design techniques.

## WEB APPLICATION DEVELOPMENT

**SubjectCode:BMCAS1—504**          **L T PC**          **Duration: 60Hrs.**
                                     **310 4**

**Objectives and Expected Outcomes**: To gain ability to develop responsive web applications 4. To explore different web extensions and web services standards.

After completion of this course the students will be able to: Develop skills in client-side web application development technologies including HTML, JavaScript, and JavaScript libraries. Design a web application using web programming patterns based on data analytics to enhance the front end user experience.

## SOFTWARE LAB IX ( BASED ON BMCAS1-503)

**SubjectCode:BMCAS1—505**          **LTPC**
                                     **0 0 42**

This laboratory course will comprise an exercises to supplement what is learnt under paper BMCAS1-:503 Object oriented analysis and design using UML.

## SOFTWARE LAB X ( BASED ON BMCAS1-504)

**SubjectCode:BMCAS1—506**          **L T P C**
                                     **0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper BMCAS1-: 504 Web application and development.

## COMPUTER GRAPHICS

**SubjectCode:BMCAS1—601**   **L T PC**   **Duration: 60Hrs.**
**3 104**

**Objectives and Expected Outcomes**: To learn the basic principles of 3- dimensional computer graphics, provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition and to provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections

After completion of this course the students will be able to: To list the basic concepts used in computer graphics. To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping. To describe the importance of viewing and projections.

## NETWORK SECURITY

**SubjectCode:BMCAS1—602**   **LTPC**   **Duration: 60 Hrs.**
**3 10 4**

**Objectives and Expected Outcomes**: This Course focuses towards the introduction of network security using various cryptographic algorithms, underlying network security applications and it also focuses on the practical applications that have been implemented and are in use to provide email and web security. After completion of this course the students will be able to:

- Describe network security services and mechanisms.
- Symmetrical and Asymmetrical cryptography.
- Data integrity, Authentication, Digital Signatures.
- Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.

## SOFT COMPUTING

**SubjectCode:BMCAS1-603**   **LTPC**   **Duration: 60Hrs**
**3104**

**Objectives and Expected Outcomes**: Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory and to introduce students to artificial neural networks and fuzzy theory from an engineering perspective.

After completion of this course the students will be able to: Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications. Reveal different applications of these models to solve engineering and other problems.

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## SOFTWARE LAB XI (BASED ON BMCAS1601)

**Subject Code: BMCAS1—604**   **L T P C**
**0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper BMCAS1-: 601 Computer Graphics.

## SOFTWARE LAB XII (BASED ON BMCAS1 603)

**Subject Code: BMCAS1—605**   **L T P C**
**0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper BMCAS1-: 603 Soft Computing.

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**MRSPTU**
**Bathinda**

**Dean Academic Affairs MRSPTU <daa@mrsptu.ac.in>**

## Fw: guidelines for masters thesis
1 message

poonam thakur <thakur10poonam@yahoo.co.in>
To: Dean Academic Affairs MRSPTU <daa@mrsptu.ac.in>

Tue, Jun 15, 2021 at 11:29 AM

----- Forwarded message -----
**From:** poonam thakur <thakur10poonam@yahoo.co.in>
**To:** sushilsingla475@gmail.com <sushilsingla475@gmail.com>
**Sent:** Tuesday, 15 June, 2021, 11:21:55 am IST
**Subject:** guidelines for masters thesis

Dr Saveen
Dean Academics

Madam
Ref to the telephonic discussions and also a query from the affiliated college.
Considering that University confers a MSc.degree in Fashion Technology,thus the guidelines issued for masters thesis in Physics can be referred pls.The same are attached herewith.

Regards

     **M.SC. Physics DISSERTATION (1).docx**
     13K

*[handwritten notes]*

AR (Acad) for DAA
16/4/21

CDEO
As discussed with Dean Academic Affairs, guidelines (given overleaf) may be applied on M.Sc (Fashion Technology) also, & upload the same on university website also.
23/06/2021.

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# DISSERTATION

M.Sc. 4th Semester will carry the dissertation work under the supervision of the assigned project guide as per following scheme:

**Format for writing dissertation work:** The students will write the report in Times New Roman, with font size 12 and 1.5 spacing.

| | |
|---|---|
| 1. Title of the M.Sc. Dissertation Work | 7. Introduction |
| 2. Self-Declaration Certificate of Original Work | 8. Methodology |
| 3. Acknowledgement | 9. Results and Discussion |
| 4. Content | 10. Conclusion |
| 5. List of Tables | 11. References |
| 6. List of Figures | 12. Student's Bio data |

**Evaluation Criteria:** The maximum marks allotted for the dissertation will be 100 which comprises of internal evaluation of 60 marks and external evaluation of 40 marks. The details of internal and external evaluation are given below:

**(A) Internal Evaluation: (MM: 60)**

The students will be evaluated based on regular performance, attendance and presentation. He/She should give power point presentation of their detail work during the mid-semester (1st and 2nd) examinations.

**Final Submission Report:**

The student will submit the final report as hard bound copies (03) and soft copy on CD/DVD. The internal awards will be given to the students after final submission of the report by the dissertation supervisor.

**(B) External Evaluation: (MM: 40)**

Evaluation will be done based on originality and quality of work, knowledge and presentation skills etc. The students should give 30minutes' presentation through power point slides in the front of a internal panel of three examiners including dissertation Supervisor, Head/Nominee and other faculty member of the Department as constituted by Head of the Department.

### SEMESTER V

Total Credits=22

| SEMESTER V | | CONTACT HOURS | | | MARKS | | | CREDITS |
|---|---|---|---|---|---|---|---|---|
| SUBJECT CODE | SUBJECT NAME | L | T | P | Int. | Ext. | TOTAL | |
| BFOTS1-501 | Unit Operations in Food Engineering | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-502 | Food Packaging | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-503 | Sugar & Confectionary Technology | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTS1-504 | Food Packaging Lab XII | - | - | 4 | 60 | 40 | 100 | 2 |
| BFOTS1-505 | Sugar & Confectionary Technology Lab XIII | - | - | 4 | 60 | 40 | 100 | 2 |
| | DEPARTMENTAL ELECTIVE | | | | | | | |
| BFOTD1-511 | Spices and Flavour Technology | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-512 | Spices and Flavour Technology Lab XIV | - | - | 4 | 60 | 40 | 100 | 2 |
| OR | | | | | | | | |
| BFOTD1-513 | Technology of Oils and Fats | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-514 | Technology of Oils and Fats Lab XV | - | - | 4 | 60 | 40 | 100 | 2 |
| | | | | | | | | |
| | TOTAL | - | - | - | 340 | 360 | 700 | 22 |

**Note: In Semester Vth, students have to choose either between BFOTD1-511, BFOTD1-512 or BFOTD1-513, BFOTD1-514**

### SEMESTER VI

Total credits=20

| SEMESTER VI | | CONTACT HOURS | | | MARKS | | | CREDITS |
|---|---|---|---|---|---|---|---|---|
| SUBJECT CODE | SUBJECT NAME | L | T | P | Int. | Ext. | TOTAL | |
| BFOTS1-601 | Food Engineering | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-602 | Food and Nutrition | 3 | 1 | - | 40 | 60 | 100 | 4 |
| | **DEPARTMENTAL ELECTIVE** | | | | | | | |
| BFOTD1-611 | Sensory Evaluation of food | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-612 | Sensory Evaluation of food Lab XVI | - | - | 4 | 60 | 40 | 100 | 2 |
| OR | | | | | | | | |
| BFOTD1-613 | Food Plant Layout | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-614 | Food Plant Layout Lab XVII | - | - | 4 | 60 | 40 | 100 | 2 |
| | **DEPARTMENTAL ELECTIVE** | | | | | | | |
| BFOTD1-621 | Food Safety | 4 | - | - | 40 | 60 | 100 | 4 |
| BFOTD1-622 | Food Safety Lab XVIII | - | - | 4 | 60 | 40 | 100 | 2 |
| OR | | | | | | | | |
| BFOTD1-623 | Food Quality Management | 4 | - | - | 40 | 60 | 100 | 4 |
| | | | | | | | | |
| BFOTD1-624 | Food Quality Management Lab XIX | - | - | 4 | 60 | 40 | 100 | 2 |
| | | | | | | | | |
| | TOTAL | - | - | - | 280 | 320 | 600 | 20 |

**Note: In Semester VIth, students have to choose either between**

**BFOTD1-611, BFOTD1-612  or  BFOTD1-613, BFOTD1-614**

**BFOTD1-621, BFOTD1-622  or  BFOTD1-623, BFOTD1-624**

Overall

| Semester | Marks | Credits |
|---|---|---|
| V[th] | 700 | 22 |
| VIth | 600 | 20 |
| **Total** | **1300** | **42** |

# SEMESTER FIFTH

## UNIT OPERATIONS IN FOOD ENGINEERING

**Subject Code: BFOTS1-501**　　　　**L T P C**　　　　　**Duration: 60 (Hrs.)**
　　　　　　　　　　　　　　　　　　**3 1 0 4**

**Course Objectives:**
1. To aware students about basic concepts of food engineering.
2. To introduce them with various unit operations.
3. To familiarize them with the properties of fluid and its flow.
4. To enhance their knowledge about pschrometry and its effect on food processing.

**Course Outcomes:**
1. Students become aware about basics of food engineering.
2. Students come to know about various unit operations in food processing.
3. Students become familiar with the properties of fluid and its flow.
4. Students learn about psychrometry and its effect on food processing

## UNIT I (12 Hrs.)

**Introduction:** Concept of unit operations
**Preliminary Unit Operations:** Material handling; Conveyors and elevators, types of conveyors and elevators.

## UNIT II (17 Hrs.)

**Cleaning:** Dry-cleaning; screening, aspiration and magnetic cleaning, wet cleaning; soaking, spray washing, ultrasonic washing, sorting and grading: methods, advantages of sorting and grading
**Size reduction:** Benefits, criteria for size reduction, size reduction of solid, fibrous and liquid foods.

## UNIT III (16 Hrs.)

**Refrigeration and Freezing:** Refrigeration, components of refrigeration system, compressors, condensers and expansion valve, selection of refrigerant, cooling load, coefficient of performance, refrigerant flow rate.
Direct contact and indirect freezing systems.

## UNIT IV (15 Hrs.)

**High temperature operations:** Pasteurization, pasteurizer and its functioning.
**Evaporation:** Single effect evaporators and multiple effect evaporators, natural and forced circulations, falling and rising film evaporators.

**Recommended Readings**
1. Rao D. G., 'Fundamentals of Food Engineering', PHI learning private ltd., 2010.
2. Singh R. P. and Heldman D. R., 'Introduction to Food Engineering', Academic press 2nd, 3rd and 4th Edition, 1993, 2003, 2009.
3. Rao C.G., 'Essentials of Food Process Engineering', B.S. publications, 2006.
4. Fellow P., Food Processing Technology, 1988.

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## FOOD PACKAGING

**Subject Code: BFOTS1-502**　　　　**L T P C**　　　　　　　　　**Duration: 60 (Hrs.)**
　　　　　　　　　　　　　　　　　　**3 1 0 4**

**Course Objectives:**
1. To make students familiar about the importance of packaging in food.
2. To make them aware about various packaging materials.
3. To provide them knowledge about machines used for packaging of foods.
4. To introduce them with various packaging systems.

**Course Outcomes:**
1. Students become familiar about the importance of packaging.
2. Students become aware about various packaging materials used in food.
3. Students learn about different machines used for food packaging.
4. Students get knowledge about various packaging systems.

## UNIT I (15 Hrs.)

Introduction to Food Packaging
Packaging Functions and Requirements, Printing of packages, Barcodes & other marking, Labelling Laws

## UNIT II (16 Hrs.)

**Food Packaging Materials**: Paper and paper-based materials, corrugated fiber board (CFB). Plastics, formation- Injection molding, Blow molding, Types of plastics, Lamination, Biodegradable plastics, Edible packaging and Bio-composites. Environmental Concerns recycling and disposal of plastic waste.

## UNIT III (14 Hrs.)

**Metal packaging- Metals**: Tinplate, tinning process, components of tinplate, tin free can (TFC) types of can, metallic films, lacquers
**Glass:** Composition, Properties, Methods of bottle making, Types of closures.

## UNIT IV (15 Hrs.)

**Packaging Machinery and Systems:** Bottling machines, Cartoning systems, Seal and Shrink packaging machine; Form, Fill and Sealing machine (FFS).
Vacuum, Controlled and Modified atmosphere packaging systems; Aseptic packaging systems; Retort packaging, Active and Intelligent packaging systems

**Recommended Readings**:
1. Robertson G. L., 'Food Packaging – Principles and Practice', CRC Press Taylor and Francis Group, 2012.
2. Paine F.A. and Paine H.Y., 'A Handbook of Food Packaging', Blackie Academic and Professional, 1992.
3. Coles R., McDowell D. and Kirwan M. J., 'Food Packaging Technology', Blackwell, 2003.

## SUGAR AND CONFECTIONARY TECHNOLOGY

**Subject Code: BFOTS1-503**      **L T P C**          **Duration: 60 (Hrs.)**
                                     **4 0 0 4**

**Course Objectives:**
1. To familiarize students with manufacturing of sugar and utilization of its byproducts.
2. To provide them knowledge about various types of icings and toppings.
3. To aware them about chocolate manufacturing and its defects.
4. To teach them about different types of candies and their process of manufacturing.

**Course Outcomes:**
1. Students become familiar with the manufacturing of sugar and utilization of its byproducts.
2. Students gain knowledge about icings and toppings.
3. Students acquire knowledge about chocolate manufacturing.
4. Students learn about the process of candy manufacturing**.**

## UNIT-I (15 Hrs.)

Composition and characteristics of cane juice, Cane juice extraction. Manufacturing of sugar. Deterioration of sugars during storage & transportation and its prevention, By-products of sugar industry and their utilization.

## UNIT-II (15 Hrs.)

**Icings and Toppings**: Fondant, American frosting, Butter cream icing, royal icing, gum paste, glace icing, marshmallow, almond paste and fudge.

## UNIT III (15 Hrs.)

**Chocolates:** Cocoa processing, Cocoa liquor, Cocoa butter. Cocoa powder and chocolate manufacturing

Chocolate tempering and lipid crystallization, Chocolate enrobing and chocolate defects.

## UNIT-IV (15 Hrs.)

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

**Recommended Books:**
1. Minife B.W, 'Chocolate, Cocoa and Confectionary: Science & Technology', AVI Publishing Co., New York, 1997.
2. Mathur R.B.L., 'Handbook of Cane Sugar Technology', Oxford & IBH Publishing Co., New Delhi, 1986.
3. Faridi H., 'The Science of Cookie & Cracker Production', Chapman & Hall, UK, 1994.

## FOOD PACKAGING LAB XII

**Subject Code: BFOTS1-504**       **L T P C**                    **Duration: 30 (Hrs.)**
                                   **0  0  4  2**

**Course Objectives:**
1. To teach students about methods used to test packaging materials.
2. To aware students about edible packaging.
3. To make them familiar with packaging machines.
4. To provide them knowledge about the effect of food package designs on storage and processing.

**Course Outcomes:**
1. Students learn about the testing of packaging materials.
2. Students become aware about edible packaging.
3. Students become familiar with packaging materials.
4. Students acquire knowledge about the effects of food package designs on storage and processing.

## PRACTICAL

1. Testing of physical/mechanical properties of food packaging materials.
2. Testing of thermal shock resistance of glass.
3. Gas/Vacuum packaging of foods
4. To Study the effect of packaging on shelf life of food products.
5. Determination of Water Vapor Transmission Rate of Packaging Material.
6. Edible packaging of Food Samples.
7. Study of Sorption Isotherm for Food Package Design.
8. Packaged food cut-out analysis.
9. To study the operation of FFS machine.

**Recommended Readings**:
1. Robertson G.L., 'Food Packaging – Principles and Practice', CRC Press Taylor and Francis Group, 2012.
2. Paine F.A. and Paine H.Y., A Handbook of Food Packaging, Blackie Academic and Professional, 1992.
3. Coles R., McDowell D. and Kirwan M. J., 'Food Packaging Technology', Blackwell, 2003.

## SUGAR AND CONFECTIONARY TECHNOLOGY LAB XIII

**Subject Code: BFOTS1-505**  **L T P C**   **Duration: 30 (Hrs.)**
**0 0 4 2**

**Course Objective:**
1. To provide knowledge about various types of sugars and its use in cookery.
2. To aware students about manufacturing of confectionary products.
3. To familiarize them with various quality parameters of confectionary products.
4. To provide practical knowledge of baking, icing and cake decoration.

**Course Outcomes:**
1. Students gain knowledge about various types of sugars and its use.
2. Students become aware about manufacturing of confectionary products.
3. Students become familiar with various quality parameters of confectionary products.
4. Students gain practical knowledge of baking, icing and cake decoration.

## PRACTICAL
1. Determine the effect of heat on sugar solution and perform the thread and cold water test.
2. To study the process of inversion, melting and caramelization in sucrose.
3. Preparation of fondant, fudge and brittles.
4. Preparation of *Shakarpara* and *Chhana murki*.
5. Preparation of candy and toffee and to perform quality assessment tests.
6. Preparation of cake decorations.
7. Collection of various types of confectionary packages.
8. Determination of sugar in confectionary product by saccharometer.
9. Determination of refractive index of sugar – solutions of different consistencies.
10. Organoleptic testing of different confectionary products.
11. Visit to sugar and confectionary industry.

**Recommended Readings:**
1. Raina et.al., 'Basic Food Preparation-A complete Manual', 3$^{rd}$ Edition, Orient Longman Pvt. Ltd., 2003.
2. Manay, S. and Shadaksharaswami, M., 'Foods: Facts and Principles', New Age Publishers, 2004.
3. Beckette S.T., 'Industrial Chocolate Manufacture', Blackwell Publishing Ltd., 2009.
4. Minifie B.W. , 'Chocolate, Cocoa and Confectionary', Aspen Publications, 1999.
5. Mohini S. and Eram R., 'Food science- Experiments and applications', 2$^{nd}$ Edition., CBS publishers & Distributors Pvt. Ltd. 2011.

## SPICES AND FLAVOUR TECHNOLOGY

**Subject Code: BFOTD1-511**        **L T P C**                    **Duration: 60 (Hrs.)**
                                    **4  0  0  4**

**Course Objectives:**
1. To provide knowledge about the chemical composition of spices.
2. To aware students about the flavor and food pigments.
3. To familiarize them with various enzymatic and non-enzymatic reactions in food.
4. To enhance their knowledge about various physical, chemical and nutritional changes in food.

**Course Outcomes:**
1. Students get knowledge about the chemical composition of food.
2. Students become aware about the flavor and food pigments.
3. Students become familiar with various enzymatic and non-enzymatic reactions in food.
4. Students acquire knowledge about various physical, chemical and nutritional changes in food.

## UNIT I (15 Hrs.)

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

## UNIT-II (15 Hrs.)

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 (16 Hrs.)

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

## UNIT IV (14 Hrs.)

Processing of white pepper, cardamom, cinnamon, cloves, turmeric, ginger, fenugreek and fennel.

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

## SPICES AND FLAVOUR TECHNOLOGY LAB XIV

**Subject Code: BFOTD1-512**          **L T P C**                    **Duration: 30 (Hrs.)**
                                       **0 0 4 2**

**Course Objective:**
1. To improve their practical knowledge about organoleptic evaluation of flavors.
2. To make them familiar with proximate analysis of spices.
3. To provide knowledge about adulterant detection in spices.
4. To detect the microbiological quality of spices.

**Course Outcomes:**
1. Students learn about organoleptic evaluation of flavors.
2. Students become familiar with proximate analysis of spices.
3. Students determine adulterants in spices.
4. Students check the microbiological quality of spices.

## PRACTICAL

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.
8. To evaluate microbiological quality of spices.

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

## TECHNOLOGY OF OILS AND FATS

**Subject Code: BFOTD1-513**  **L T P C**  **Duration: 60 (Hrs.)**
**4 0 0 4**

**Course Objectives:**
1. To introduce students with physical and chemical properties of fats and oils.
2. To aware students about different sources of animal and plant fat.
3. To provide them knowledge about rancidity, refining, bleaching and deodorization of fats.
4. To familiarize them with process of hydrogenation and winterization of oils.

**Course Outcomes:**
1. Students become familiar with physical and chemical properties of fats and oils.
2. Students become aware about sources of animal and plant fats.
3. Students acquire knowledge about various processes such as refining, bleaching and deodorization.
4. Students learn about the process of hydrogenation and winterization of oils.

### UNIT-I (14 Hrs.)

Introduction to oils and fats, Physical and chemical properties of fats and oils, Nutritional importance of oils and fats.

### UNIT-II (16 Hrs.)

**Source and physico-chemical properties of following oils:**
a) Animal – Butter oil, lard and tallow.
b) Plant – Groundnut, Sunflower, Soybean and Coconut oil.
Extraction of oils/fats.
Problems during storage – rancidity, reversion.

### UNIT-III (15 Hrs.)

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

### UNIT-IV (15 Hrs.)

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

**Recommended Books:**
1. Meyer L.H., 'Food Chemistry', CBS Publisher, New Delhi, 2006.
   Potter N. N. 'Food Science', 5th Edition, CBS Publisher, New Delhi, 2006
2. Lawson H., 'Food Oils & Fats: Technology, Utilization and Nutrition', CBS Publisher, New Delhi, 1995.

## TECHNOLOGY OF OILS AND FATS XV

**Subject Code: BFOTD1-514**          **L T P C**          **Duration: 30 (Hrs.)**

                                       **0 0 4 2**

**Course Objectives:**

1. To make them familiar with proximate analysis of oils and fats.
2. To aware them about adulteration of oils and detection of adulterants.
3. To perform refining and bleaching of oils.
4. To provide them platform to experience actual working environment of an industry.

**Course Outcomes:**

1. Students carry out the proximate analysis of fats and oils.
2. Students learn to detect adulterants in milk.
3. Students perform refining and bleaching of oils.
4. Students visit a vegetable oils industry and become familiar with the industrial environment.

# PRACTICAL

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. To carry out refining and bleaching of oil in lab.
10. To estimate colour of oil.
11. Visit to vegetable oils industry.

# SEMESTER

# SIXTH

## FOOD ENGINEERING

**Subject Code: BFOTS1-601**          **L T P C**          **Duration: 60 (Hrs.)**

                                      **3  1  0  4**

**Course Objectives:**
1. To familiarize students with the basic concepts of food engineering including units and dimensions
2. To introduce students with the basic principles of material and energy balances.
3. To aware students about principles of fluid flow and its effect in food processing.
4. To provide them knowledge about psychometric charts and its use in food industries.

**Course Outcomes:**
1. Students become familiar with the basic concepts of food engineering.
2. Students acquire knowledge about basic principles of material and energy balances.
3. Students become aware about principles of fluid flow and its effect in food processing.
4. Students learn to study psychometric charts and using them in food industries.

# UNIT I (15 Hrs.)
**Fundamental Concepts and Definitions:** Dimensions and units, thermodynamic systems (closed, open and isolated), intensive and extensive properties, equilibrium state, density, specific volume, specific weight, specific heat, enthalpy, entropy, pressure, temperature scales.

# UNIT II (15 Hrs.)
**Material Balances:** Basic principles, process flow diagrams, total mass balance, component mass balance.

**Energy Balances:** Basic principles, energy terms, specific heat of solids and liquids, properties of saturated and superheated steam, heat balances.

# UNIT III (15 Hrs.)
**Fluid Flow Principles:** Fluid statics and dynamics, mass balance and energy balance, Bernoulli's equation, concept of viscosity, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Reynold's number, Selection of pumps

# UNIT IV (15 Hrs.)
**Psychrometrics:** Properties of dry air: composition of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature, Wet bulb temperature, Relative humidity, Dew point temperarure.

**Recommended Readings:**
1. Rao C.G., 'Essentials of Food Process Engineering'. B S publications, 2006
2. Rao D.G., 'Fundamentals of Food Engineering', PHI learning private Ltd., 2010.
3. Singh R.P. and Heldman D.R., Introduction to Food Engineering, 2$^{nd}$, 3$^{rd}$ and 4$^{th}$ Edition, Academic press, 1993, 2003, 2009.
4. Fellow P., Food Processing Technology, 1988.

## FOOD AND NUTRITION

**Subject Code: BFOTS1-602**　　　　**L T P C**　　　　　　**Duration: 60 (Hrs.)**
　　　　　　　　　　　　　　　　　　**3 1 0 4**

**Course Objectives:**
1. To understand the concepts of food and nutrition.
2. To aware students about balanced diet and food groups.
3. To familiarize students with RDA and its importance.
4. To teach them the importance of meal planning in diet.

**Course Outcomes:**
1. Students understand the concepts of food and nutrition.
2. Students become aware about balanced diet and various food groups.
3. Students become familiar with RDA and its importance.
4. Students get knowledge about the importance of meal planning.

### UNIT I (15 Hrs.)

**Introduction to food and nutrition**: Basic terms used in study of food and nutrition, BMI and nutritional status, understanding relationship between food, nutrition and health. Balanced diet Functions of food-physiological, psychological and social, concept of balanced diet, Food Groups, Food Pyramid.

### UNIT II (16 Hrs.)

**Nutrients:** Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption of the following in brief: Energy, Carbohydrates, lipids and proteins, Fat soluble vitamins-A, D, E and K, Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C
Minerals – calcium, iron, iodine, fluorine, copper and zinc

### UNIT III (14 Hrs.)

**Concepts of Meal planning:** Factors affecting meal planning, understanding specific considerations for planning meal for
different groups of people (Infants, Toddler, Adolescents, Adults, Old age and pregnant women)

### UNIT IV (15 Hrs.)

**Methods of cooking**: Dry, moist, frying and microwave cooking, Advantages, disadvantages and the effect of various
methods of cooking on foods.
Nutritional labeling.
Importance, global trends, codex guidelines, nutritional labelling in India, FSSAI guidelines.

**Recommended Readings**
1. Bamji M.S., Krishnaswamy K. and Brahmam G.N.V., 'Textbook of Human Nutrition', 3rd Edition, Oxford and IBH Publishing Co. Pvt. Ltd., 2009.
2. Srilakshmi 'Food Science', 4th Edition, New Age International Ltd., 2007.
3. Srilakshmi, 'Dietetics', Revised 5th Edition. New Age International Ltd., 2005.
4. Wardlaw M.G. and Paul M Insel Mosby, 'Perspectives in Nutrition', 3rd Edition, 1996.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2_1985) (Rev.1_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation, 1993.
6. Food Safety and Standards Authority of India portal, Government of India
7. Gopalan C., 'Nutritive Value of Indian Foods', NIN, ICMR, 1990.
8. Seth V. and Singh K., 'Diet planning through the Life Cycle: Part 1. Normal Nutrition. A
9. Practical Manual., 4th Edition, Elite Publishing House Pvt. Ltd., 2005.

## SENSORY EVALUATION OF FOOD

**Subject Code: BFOTD1-611**          **L T P C**          **Duration: 60 (Hrs.)**
                                      **4 0 0 4**

**Course Objectives:**
1. To aware students about structure and functions of taste organs.
2. To provide knowledge about taste measurements and taste abnormalities.
3. To make them familiar with the importance of odour, flavor and colour in sensory evaluation of food.
4. To understand the importance of texture and texture perception.

**Course Outcomes:**
1. Students become aware about structure and functions of taste organs.
2. Students acquire knowledge about taste measurements and taste abnormalities.
3. Students become familiar with the importance of odour, flavor and colour in sensory evaluation of food.
4. Students understands the concept of texture and texture perception.

# UNIT I (16 Hrs.)

**Taste:** Introduction and importance of taste**,** Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands**,** Mechanism of taste perception
**Chemical dimensions of basic tastes**: sweet, salt, sour, bitter and umami
Factors affecting taste quality, reaction time, taste modification, absolute and recognition of threshold taste abnormalities.
Taste measurement

# UNIT II (15 Hrs.)

**Odour:** Introduction, definition and importance of odour and flavor**,** Anatomy of nose, physiology of odour perception**,** Mechanism of odour perception
Odour classification, chemical specificity of odour.
Odour measurement using different techniques – primitive to recent techniques. Merits and demerits of each method. Olfactory abnormalities.

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## UNIT III (16 Hrs.)

**Colour:** Introduction and importance of colour.
Dimensions of colour and attributes of colour, appearance factors, gloss etc.
Perception of colour, Colour abnormalities
**Measurement of colour;** Munsell colour system, CIE colour system, Hunter colour system, spectrophotometry and colorimetry etc.

## UNIT IV (13 Hrs.)

**Texture:** Introduction, definition and importance of texture
Phases of oral processing
Texture perception, receptors involved in texture perception
Texture classification
**Texture measurement** – basic rheological models, forces involved in texture measurement.

### Recommended Readings
1. Rao E. S., 'Food Quality Evaluation', Variety Books, 2013.
2. Amerine P. and Roessler, 'Principles of Sensory Evaluation of Food', Academic Press, London, 1965.
3. Meilgard D., 'Sensory Evaluation Techniques', 3rd Edition. CRC Press LLC, 1999.
4. Man J., 'Principles of Food Chemistry', 3rd Edition., Springer, 2007.
5. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.

## SENSORY EVALUATION OF FOOD LAB XVI

**Subject Code: BFOTD1-612**   **L T P C**   **Duration: 30 (Hrs.)**
                               **0 0 4 2**

**Course Outcomes:**
1. To aware students about the importance of sensory panel.
2. To provide them practical knowledge of various sensory tests.
3. To provide them a platform for the sensory evaluation of various food products.
4. To familiarize them with various quality tests for milk products, cereals and confectionary products.

**Course Outcomes:**
1. Students become aware about the importance of sensory panel.
2. Students acquire knowledge about various sensory tests.
3. Students perform sensory evaluation of various food products.
4. Students become familiar with various quality tests of different food products.

### PRACTICAL

1. Training of sensory panel.
2. To perform recognition and sensitivity tests for four basic tastes.
3. To perform analytical tests of sensory evaluation.

4. Recognition tests for various food flavors, flavor defects in milk.

5. Sensory evaluation of milk and milk products.

6. Texture evaluation of various food samples- crispier/ cookies/ biscuits/ snack foods

7. Measurement of colour by using Tintometer/ Hunter Color Lab etc.

8. Qualitative tests for hydrogenated fats, butter, ghee

9. Platform tests for milk

10. Quality evaluation of various food stuffs- cereals, pulses, honey, jaggery, sugar, tea, coffee etc.

**Recommended Readings**
1. Rao E. S., 'Food Quality Evaluation', Variety Books, 2013.
2. Amerine P. and Roessler, 'Principles of Sensory Evaluation of Food', Academic Press, London, 1965.
3. Meilgard 'Sensory Evaluation Techniques', 3$^{rd}$ Edition. CRC Press LLC, 1999.
4. deMan J., 'Principles of Food Chemistry', 3$^{rd}$ Edition., Springer, 2007.
5. Brannen and et al., 'Food Additives', Marcel Dekker, New York, 1990.

## FOOD PLANT LAYOUT

**Subject Code: BFOTD1-613**　　　**L T P C**　　　　　　**Duration: 60 (Hrs.)**
　　　　　　　　　　　　　　**4 0 0 4**

**Course Objectives:**
1. To provide them knowledge about concepts of designing and importance of a good layout.
2. To teach them about the importance of plant site and location factors.
3. To make them familiar about the selection of plant building material and equipments.
4. To aware them about layout symbols.

**Course Outcomes**
1. Students get knowledge about concepts of designing and importance of a good layout.
2. Students learn about the importance of site selection.
3. Students become familiar about the selection of plant building material and equipments.
4. Students become aware about layout symbols.

## UNIT-I (15 Hrs.)

Plant design concepts and general design considerations

Plant Layout problems, Importance and Objectives

Advantages of a good layout

## UNIT-II (15 Hrs.)

**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-III (15 Hrs.)

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 IV (15 Hrs.)
Management set up in a plant. Plant layout, layout symbols.

**Recommended Books:**
1. Marriott, 'Principle of Food Sanitation', 5th Edition, CBS Publishers, New Delhi, 2006.
2. Green J.H. and Kramer A.,'Food Processing Waste Management', AVI Publishers,USA.,1979.
3. Potter N. N., 'Food Science', 5th Edition., CBS Publishers, New Delhi, 2006.
4. Sharma S.C., 'Plant Layout and Material Handling', 3rd Edition Khanna Publishers, 2000.
5. James M. M., 'Plant layout & design', Collier Macmillan Ltd., 1962

## FOOD PLANT LAYOUT LAB XVII

**Subject Code: BFOTD1-614**     **L T P C**     **Duration: 30 (Hrs.)**
                                      **0 0 4 2**

**Course Objectives:**
1. To prepare layouts for different processing plants.
2. To prepare process diagrams of various manufacturing units.
3. To teach them about the calculations related to processing cost.
4. To aware them about the processes to calculate the life of various machines and equipments in the plant.

**Course Outcomes:**
1. Students prepare layouts for different processing plants.
2. Students learn to prepare to process diagrams for various manufacturing units.
3. Students become aware about the calculations related to processing cost.
**4.** Students become familiar about the shelf life estimation of various machines.

## PRACTICAL
1. Preparation of layout and process diagram of potato crisp manufacturing plant.
2. Preparation of layout and process diagram of Jam/Marmalade manufacturing plant.
3. Preparation of layout and process diagram of Bread making plant.
4. Preparation of layout and process diagram of a dairy industry.
5. Preparation of layout and process diagram of wine making unit.
6. Preparation of layout and process diagram of a modern slaughter house.
7. Preparation of layout and process of diagram of a confectionary unit.
8. Calculation of depreciation of machinery and processing costs.

## FOOD SAFETY

**Subject Code: BFOTD1-621**          **L T P C**          **Duration: 60 (Hrs.)**
                                      **4 0 0 4**

**Course Objectives:**
1. To aware students about food safety and importance of food safety.
2. To make them familiar about various food hazards and its impact on health.
3. To provide them knowledge about food safety tools and their need for food quality.
4. To enrich their knowledge about different food safety laws.

**Course Outcomes:**
1. Students become aware about food safety and its importance.
2. Students become familiar with various food hazards and its impact on health.
3. Students get knowledge about food safety tools and their need for food quality.
4. Students acquire knowledge about different food safety laws.

## UNIT I (15 Hrs.)

Introduction to Food Safety
Definition, Types of hazards, biological, chemical, physical hazards, Factors affecting Food Safety, Importance of Safe Foods
Food Hazards of Physical and Chemical and Microbiological origin, Management of hazards, Need, Control of parameters, Temperature control and Food storage

## UNIT II (14 Hrs.)

Hygiene and Sanitation in Food Service Establishments
Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control and Personnel Hygiene

## UNIT III (16 Hrs.)

Food laws and Standards
Indian Food Regulatory Regime, Global Scenario and Other laws and standards related to food safety (FSSAI, AGMARK, FPO, MFPO, MPO, BIS AND ISO)

## UNIT IV (15 Hrs.)

Recent concerns
New and Emerging Pathogens, Genetically modified foods\Transgenics, Organic foods and newer approaches to food safety

**Recommended Readings**
1. Lawley R., Curtis L. and Davis J., 'The Food Safety Hazard Guidebook', RSC publishing, 2004.
2. De Vries, 'Food Safety and Toxicity', CRC, New York, 1997'
3. Marriott, N. G., 'Principles of Food Sanitation', AVI, New York, 1985.
4. Forsythe, S. J., 'Microbiology of Safe Food', Blackwell Science, Oxford, 2000.

5. Forsythe S. J., 'The Microbiology of Safe Food', 2<sup>nd</sup> Edition, Willey- Blackwell, U.K., 2010.
6. Mortimore S. and Wallace C. 'HACCP, A practical approach', Chapman and Hill, London, 1995.
7. Clive de Blackburn and Peter McClure., Foodborne Pathogens Woodhead Publishing, 2009.

## FOOD SAFETY LAB XVIII

**Subject Code: BFOTD1-622**          **L T P C**          **Duration: 30 (Hrs.)**
                                       **0 0 4 2**

**Course Objectives:**
1. To teach them about preparation of selective and complex media.
2. To improve their practical handling of microbiological tools.
3. To provide knowledge about different methods of staining and its use in food safety.
4. To aware them about the importance of personal hygiene and its assessment.

**Course Outcomes:**
1. Students learn about media preparation.
2. Students acquire knowledge about handling of microbiological tools.
3. Students get knowledge about different methods of staining and its use in food safety.
4. Students become aware about the importance of personal hygiene and assessment of personal hygiene.

## PRACTICAL

1. Preparation of different types of media (complex, differential and selective)
2. Enumeration of aerial microflora using PDA
3. Identification of Molds by lactophenol blue staining
4. Negative Staining
5. Microbiological Examination of food
6. Bacteriological Analysis of Water by MPN method
7. Assessment of surface sanitation by swab and rinse method
8. Assessment of personal hygiene
9. Detection of Physical and chemical hazards in food.
10. Determination of coliforms in water.

**Recommended Readings**
1. Lawley R., Curtis L. and Davis J., 'The Food Safety Hazard Guidebook', RSC publishing, 2004.
2. De Vries, 'Food Safety and Toxicity', CRC, New York, 1997.
3. Marriott, N. G., 'Principles of Food Sanitation', AVI, New York, 1985.
4. Forsythe, S. J., 'Microbiology of Safe Food', Blackwell Science, Oxford, 2000.

5. Forsythe S. J., 'The Microbiology of Safe Food', 2nd Edition, Willey- Blackwell, U.K., 2010.
6. Mortimore S. and Wallace C. 'HACCP, A practical approach', Chapman and Hill, London,1995.
7. Clive de Blackburn and Peter McClure., Foodborne Pathogens Woodhead Publishing, 2009.

## FOOD QUALITY MANAGEMENT

**Subject Code: BFOTD1-623**          **L T P C**          **Duration: 60 (Hrs.)**
                                      **4 0 0 4**

### Course Objectives:
1. To aware students about quality concepts, quality perception, quality attributes of foods.
2. To familiarize students to concepts of quality management
3. To aware students about food contamination, heavy metals, pesticide residues, antibiotics, agrochemicals, veterinary drug residues, environmental pollutants.
4. To aware students about need of food additives in food processing and preservation.

### Course Outcomes:
1. Students become aware about different physical, chemical and biological contaminants.
2. Students become aware to quality control and quality assurance in food.
3. Students get knowledge about different food additive and food preservatives.
4. Students acquire knowledge about cryogenic freezing, supercritical fluid extraction, fat mimetics, flavour encapsulation.

## UNIT I (15 Hrs.)

Introduction to food quality management – Definition of quality, quality concepts, quality perception, quality attributes.
**Concepts of quality management**: Objectives, importance and functions of quality control and quality assurance; Quality management systems in India
Quality in the Agri- food production chain-Techno- managerial approach, food quality relationship and food quality management functions. Dynamics on the agri- food production chain, core developments in food quality management.

## UNIT II (15 Hrs.)

**Contamination in Food:** Physical, chemical contaminants (heavy metals, pesticide residues, antibiotics, agrochemicals, veterinary drug residues, environmental pollutants, radionucleides, solvent residues, chemicals) and Natural toxins.

## UNIT III (15 Hrs.)

Chemical, technological and toxicological aspects
**Risk assessment studies**: Safety and quality evaluation of additives and contaminants, Acute and chronic studies. Introduction, need of food additives in food processing and preservation, Characteristics and classification of food additives.
Antimicrobial agents. -Nitrites, sulphides, sulphur dioxide, sodium chloride, hydrogen peroxide.

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## UNIT IV (15 Hrs.)

High fructose corn syrup, cryogenic freezing, supercritical fluid extraction, fat mimetics, flavour encapsulation, use of nano technology in foods etc.

**Recommended Readings**
1. Pieternel A, L. and Willem J. M., 'Food Quality Management Technological and Managerial principles and practices', Wageningen, 2009.
2. Brannen and et al., 'Food Additives', Marcel Dekker, New York,1990.
3. Jones J. M., 'Food Safety', Eagan Press, 1992.
4. Shapton D.A. and Shapton N.F., 'Principles and Practices for the safe processing of Foods' CRC Press, 1998.
5. DeMan, 'Principles of Food Chemistry', 3rd edition, Springer, 2007.

## FOOD QUALITY MANAGEMENT LAB XIX

**Subject Code: BFOTD1-624**          **L T P C**          **Duration: 30 (Hrs.)**
                                       **0 0 4 2**

**Course Objectives:**
1. To aware students about qualitative analysis of various milk products.
2. To familiarize students with quality inspection of cereals, pulses and spices.
3. To determine various contaminants in water.
4. To provide students a platform for quality testing of various food products.

**Course Outcomes:**
1. Students become aware about qualitative analysis of various milk products.
2. Students become familiar with quality inspection of cereals, pulses and spices.
3. Students determine different contaminants in water.
4. Students learn about quality testing of different food.

## PRACTICAL

1. Qualitative tests for hydrogenated fats, butter, and ghee.
2. Quality inspection of various food stuffs- cereals, pulses, spices and condiments etc.
3. Estimation of sulphur dioxide in foods
4. Chromatographic estimation of colour.
5. Analysis of edible common salt for moisture content, MIW and total chlorides.
6. Estimation of ammonia nitrogen in water.
7. Estimation of benzoic acid/ sorbic acid in foods.
8. To implement HACCP plan in particular phases of food chain.
9. To evaluate various processes in food plant for implementation of GMP.
10. Determination of insecticides in given food samples.
11. Determination of heavy metals in food samples.

**Recommended Readings**

1. Pieternel A, L. and Willem J. M., 'Food Quality Management Technological and Managerial principles and practices', Wageningen, 2009.
2. Brannen and et al., 'Food Additives', Marcel Dekker, New York,1990.
3. Jones J. M., 'Food Safety', Eagan Press, 1992.
4. Shapton D.A. and Shapton N.F., 'Principles and Practices for the safe processing of Foods' CRC Press, 1998.
5. DeMan, 'ssPrinciples of Food Chemistry', 3rd edition, Springer, 2007

## MRSPTU B.Sc. (FOOD SCIENCE AND TECHNOLOGY)/B.F.S.T (Hons.) SYLLABUS 2021 BATCH ONWARDS

Total Credits =21

| Semester 1st | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject code | Subject Name | L | T | P | Internal | External | Total | |
| BFOTS1-101 | General Microbiology | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-106 | Introduction to Food Technology-I | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-103 | *Mathematics | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-104 | Computer Science and Applications | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-105 | General Microbiology Lab I | - | - | 4 | 60 | 40 | 100 | 2 |
| BPHAR0-002 | **Life Sciences | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BHUMA0-001 | Communicative English | 3 | - | - | 40 | 60 | 100 | 3 |
| Total | | - | - | - | 260 | 340 | 600 | 21 |

*Mathematics for Medical Students
** Life Sciences for Non-Medical students.

Total Credits =19

| Semester 2nd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject code | Subject Name | L | T | P | Internal | External | Total | |
| BFOTS1-201 | Introduction to Food Technology II | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-202 | Principles of Food Preservation | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-203 | Environmental studies | 3 | - | - | 40 | 60 | 100 | 3 |
| BFOTS1-204 | Food Chemistry | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BFOTS1-205 | Introduction to Food Technology II Lab-II | - | - | 4 | 60 | 40 | 100 | 2 |
| BFOTS1-206 | Principles of food preservation Lab-III | - | - | 4 | 60 | 40 | 100 | 2 |
| Total | | - | - | - | 280 | 320 | 600 | 19 |

# SEMESTER FIRST

## GENERAL MICROBIOLOGY

**Subject Code: BFOTS1-101**  **L T PC**  **Duration: 60Hrs.**
**3 1 0 4**

**Course Objectives:**
1. To introduce students with the world of microbiology.
2. To familiarize them with different types of micro-organisms.
3. To teach them about cultivation and control of micro-organisms.
4. To aware them about the factors affecting the growth of micro-organisms.

**Course Outcomes:**
1. Students acquire knowledge about microbiology.
2. They become familiar with different types of micro-organisms.
3. Students learn about the techniques of cultivation and control of micro-organisms.
4. Students become aware about the factors affecting the growth of micro-organisms.

### UNIT-I (15Hrs.)
**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.

### UNIT-II (15Hrs.)
**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 (15Hrs.)
**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 ongrowth.

### UNIT-IV (15Hrs.)
**Cultivation of micro-organisms:** Pour plate method, spread plate method and streak plate
**Control of Micro-organisms:** Control of micro-organisms by physical, chemical and biological methods.

**Recommended Books:**
1. Pelczar M. J., Chan E.C.S. and Krieg N.R., 'Microbiology', 5th Edition., McGraw Hill Co, Singapore,**1987**.
2. Stanier R.Y., Graham J.L., Wheelies M.L. and Painter P.R., 'General Microbiology', 5thEdition., The Macmillan Press Ltd.,London,**1993**.
3. Cappuccino J.G. and Sherman N., 'Microbiology: A Laboratory Manual', Benjamine-Cummings Publishing Co., USA,**200**4.
4. Gunase K. P., 'Laboratory Manual in Microbiology', New Age International (P) Ltd. New Delhi,**1996**

## INTRODUCTION TO FOOD TECHNOLOGY-I

Subject code: BFOTS1-106      **L T P C**      **Duration: 60Hrs.**
                                        **3 1 0 4**

**Course Objectives:**
1. To make students familiar with food science and technology.
2. To provide them detailed knowledge about structure of different cerealgrains.
3. To aware them about processing of pulses.
4. To give them an overview of fats and oils.

**Course Outcomes:**
1. Students become familiar with food science and technology.
2. Students acquire knowledge about structure of different cerealgrains.
3. Students become aware about processing of pulses.
4. Students get knowledge about fats and oils.

### UNIT-I (11Hrs.)
Introduction to Food Science and Technology, its scope and importance.

### UNIT-II (18Hrs.)
Compositional, Nutritional and Technological aspects of Plant foods
**Wheat**: structure and composition, types (hard, soft/strong, weak) Diagrammatic representation of structure of wheat grain.
**Rice**: Structure and composition, parboiling of rice- advantages and disadvantages. Malting, gelatinization of starch, types of browning- Maillard & caramelization.
**Corn**: Structure and composition, Dry and wet milling.
**Millets**: Types of millets and its nutritional properties

### UNIT-III (15Hrs.)
**Pulses:** Structure and composition of pulses, toxic constituents in pulses, processing of pulses: soaking, germination, decortication, cooking and fermentation.

### UNIT-IV (16Hrs.)
**Fats and Oils:** Classification of lipids, types of fatty acids - saturated fatty acids, unsaturatedfatty acids, essential fatty acids, trans fatty acids. Rancidity –Types- hydrolytic and oxidative rancidity and its prevention.

**RecommendedBooks**
1. Manay, S. and Shadaksharaswami, M., 'Foods: Facts and Principles', New Age Publishers, 2004.
2. Srilakshmi B., 'Food science', New Age Publishers,**2002**.
**3.** Meyer L. H., 'Food Chemistry', New Age,**2004**
4. Kenneth F. et al, edited-Vol-1, 2, 'The Cambridge World History of Food, Cambridge', Univ. Press,**2000**.
5. Eastwood M., 'Principles of Human Nutrition', 2nd Edition, Blackwell Publishing,**2003**.

## MATHEMATICS

**Subject Code: BFOTS1-103**          **L T PC**                    **Duration:60Hrs.**

**3 1 0 4**

**Course Objectives:**
1.    To introduce students with basics of mathematics.
2.    To provide them knowledge about mensuration techniques.
3.    To make them familiar with quadratic equations.
4.    To teach them about matrix and determinants.

**Course Outcomes:**
1.  Students become familiar with basics of mathematics.
2.  Students get knowledge about mensuration techniques.
3.  Students learn about the quadratic equations.
4.  Students acquire knowledge about matrix and determinants.

## UNIT-I (17Hrs.)

**Mensuration**: Mensuration of rectangles, easy examples of garden paths, cost of planting trees and fencing gardens. Area of right angled triangles area and height of isosceles and equilateral triangles, area of triangles in terms of sides, rent of field. Area of parallelograms, rhombus, quadrilateral and trapezoid. Regular polygons with emphasis on hexagon and octagon. Simple cases of similar figures. Circumference and area of circles. Circular rings. Cost of fencing circular fields and paths.

## UNIT-II (14Hrs.)

**Mensuration**: Volumes of cubes and rectangular solids. Cubic contents of tanks and cisterns, Volumes of triangular & rectangular prisms, right circular cylinders and segments of cylinders (Easy numerical examples based on Science only to be set Proofs of formulae).

## UNIT-III (15Hrs.)

Algebra: Solution of quadratic equations and of those reducible to quadratic equation (One variable). Relation between roots and co-efficients.nth term and sum to n terms of an A. P. and G.P. nth term of an H. P.(excluding means and problems on numbers). Permutation and combinations: simple problems only. (Proofs of formulae not required).

## UNIT-IV (14Hrs.)

Matrix and Determinant: Introduction matrices, Types of matrices, Operation of matrices, Transpose of matrix, Matrix multiplication, Determinants, Properties of determinants, Products of determinants, Minors and co-factors, Adjoint of a square matrix, Singular and non singular matrices, Inverse of Matrices.

**Recommended Books**

1. Algebra by Kapoor D. C. and SinghG.
2. Algebra by Nagpal T. N. and GuptaK.K.
3. Comprehensive Calculus by Dehiya R.S.
4. New Style Calculus for T. D.C

## COMPUTER SCIENCE & APPLICATIONS

**Subject Code: BFOTS1-104**          **L T P C**          **Duration: 60Hrs.**
                                      **3 1 0 4**

**Course Objectives:**

1. To introduce students with history and basic architecture of computer.
2. To familiarize students with operating systems.
3. To aware students about networks used for communication.
4. To provide them knowledge about data security.

**Course Outcomes:**

1. Students become aware about the history and architecture of computer.
2. Students become familiar with different operating systems.
3. Students get knowledge about networks used for communication.
4. Students learn about data security.

### UNIT-I (16Hrs.)

Computer Fundamentals Introduction to Computers: Characteristics of computers, Historical perspectives of computers, Computer generations, types of computers and uses, Software, Hardware, Basic architecture and functions of CPU and its parts, Important I/O devices like Keyboard, Mouse, Printers, Video Monitors.
**Memory Storage:** Memory Cells, Semiconductor and Magnetic core memory, ROM (its types), RAM, Cache and Virtual memory, Secondary storage devices and their organization (Hard disk, Floppy disk, CD, DVD).

### UNIT-II (16Hrs.)

**Operating Systems:** Definitions, Need, Organization, Functions, Types of Operating Systems, DOS, Windows, Handling Drives, Directories and files, Commands (Internal & External), Icons, Clipboard, Folders, Major differences between DOS & Windows.
**Communication Networks:** Hardware and software components, seven layers of OSI architecture, Network Topologies (Ring, Star, Fully Connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, World Wide Web and I.T., Browsers, Important terminology regarding Internet applications.

### UNIT-III (14Hrs.)

**Computer Applications Word Processing:** Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc. using MS-Word.
**Spreadsheet Package:** Worksheets, formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel.

## UNIT- IV (14Hrs.)

**Computer Applications Graphics:** Objectives and types of graphics, Presentation packages, Slides designing, Diagrams and graphs, Import & Export data using MS-Power Point.

**Data Security against Viruses:** Definition of computer viruses, detection, prevention and cure against viruses using anti-virus software packages.

### Recommended Books

1. Rajaraman, 'Fundamentals of Computers', Prentice Hall ofIndia.
2. N.K. Tiwari, 'Computer Fundamental with Pharmacy Applications', 1st Edition, Pharm. MedPress,2008.
3. Stultz, 'Learn MS-Office 2000', BPBPublications.
4. Ivens, 'Using Microsoft Windows', Prentice Hall of India,**1998.**
5. Stultz, 'Learn DOS in a day', BPBPublication.

## LAB-I GENERAL MICROBIOLOGY

**Subject Code: BFOTS1-105**  **L T PC**  **Duration: 30Hrs.**
**0 0 4 2**

### Course Objectives:

1. To familiarize students with different equipment's used in microbiology.
2. To provide them detailed knowledge about media preparation.
3. To improve their practical skills required for handling microbiological tools.
4. To demonstrate different methods of staining.

### Course Outcomes:

1. Students become familiar with different equipment's used in microbiology.
2. Students acquire knowledge about media preparation.
3. Students learn practical skills required for handling microbiological tools.
4. Students become aware about different methods of staining.

### Practical

1. To study different parts of amicroscope.
2. Study of instruments (Autoclave, Hot air oven, Incubator, Laminar flow, pH meter, and spectrophotometer) of microbiologylaboratory.
3. Preparation of nutrient agar and MacConkey's Agar plates, slants andbroth.
4. To study the serial dilutionmethod.
5. To perform pour plate, spread plate and streak plate methods for isolation and enumeration of micro-organisms.
6. To perform Simple staining.
7. To stain the given bacteria by Gram's stainingmethod.
8. To perform negative staining.
9. To determine the number of micro-organisms with a Haemocytometer.
10. To determine the motility of bacteria by hanging dropmethod.

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**LIFE SCIENCES**

Subject code: BPHAR0-002      **L T PC**      **Duration: 60 Hrs.**
**3 1 0 4**

### Course Objectives
1. To familiarize students with cell and molecular biology.
2. To aware them about the mechanism of digestion, absorption and respiration.
3. To enrich their knowledge about human health and disease.
4. To teach them about structure and functions of various food components

### Course outcome:
1. Students become familiar with cell and molecular biology.
2. Students become aware about the mechanism of digestion, absorption and respiration.
3. Students learn about human health and disease.
4. Students acquire knowledge about the structure and functions of various food components.

### UNIT-I (15Hrs.)
**Cell & Molecular Biology:** Cell theory, Prokaryotic cell, eukaryotic cell, cell wall, cell membrane, cytoskeleton, nucleus, chloroplast, mitochondria, endoplasmic reticulum, golgi bodies, ribosomes, lysosomes, vacuoles and centrosomes.

### UNIT- II (15Hrs.)
Cell cycle & division, amitosis, mitosis and meiosis. Study of genetic material, structure of DNA and RNA, replication, transcription, genetic code, translation & DNArepair.

**Human physiology:** Digestion and absorption, breathing and respiration, circulation, excretory system, nervous system, skeletal and muscular systems.

### UNIT-III (12Hrs.)
**Human health and diseases:** Pathogens, Parasites causing human disease (malaria, dengue, chickenguinea, typhoid, pneumonia, common cold, ringworm) and their control. Basic concepts of immunology, vaccines, antibiotics, cancer, HIV and AIDS.

### UNIT-IV (18Hrs.)
**Biotechnology and its applications:** Recombinant DNA technology, applications in health, agriculture and industries, genetically modified organisms; Plant breeding, tissue culture, single cell protein, Transgenic plants and transgenic animals**.**

### Recommended books:
1. Lehninger A. L., David L. N. and Michael M. C., 'Principles of Biochemistry', Worth Publishers, **1993**.
2. Singh B.D., 'Biotechnology', KalyaniPublishers.
3. Harvey L., Arnold B., Chris A. K., Paul M., Monty K., Jems D. and Mathew P. S., 'Molecular Cell Biology', W.H. Freeman,**2004**.

## COMMUNICATIVE ENGLISH

**Subject Code: BHUMA0-001**          **L T P C**                    **Duration:45 Hrs.**
                                         **3 0 0 3**

**Course Objectives:**
1.     To aware students about the importance of communication along with its process.
2.     To enhance their knowledge about different barriers and elements of communication.
3.     To familiarize them with different styles of communication.
4.     To improve their skills required for presentations and group discussions.

**Course Outcomes:**
1.   Students become aware about importance and process of communication.
2.   Students come to know about barriers and elements of communication.
3.   Students become familiar with different styles of communication.
4.   Students gain enough confidence for giving presentations and group discussions**.**

### UNIT-I (12 Hrs.)

**Communication Skills:** Introduction, Definition, the Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context
**Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

### UNIT-II (11Hrs.)
**Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.
**Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.
### UNIT-III (12Hrs.)
**Communication Styles:** Introduction, The Communication Styles Matrix with example for each Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.
**Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, becoming an Active Listener, Listening in Difficult Situations

### UNIT-IV (10Hrs.)
**Interview Skills:** Purpose of an interview, Do's and Don'ts of an interview
**Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery
**Group Discussion:** Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

**Recommended Books**

1. Ruther Ford A. J., 'Basic Communication Skills for Technology', 2$^{nd}$ Edition, Pearson Education,**2011.**
2. Kumar S. and Pushplata, 'Communication Skills', 1$^{st}$ Edition, Oxford Press,**2011.**
3. Stephen P. Robbins, 'Organizational Behaviour', 1$^{st}$ Edition, Pearson,**2013**.
4. Gill H., 'Brilliant-Communication Skills', 1$^{st}$ Edition, Pearson Life,**2011**.
5. Gopalawamy R., 'The Ace of Soft Skills: Attitude, Communication and Etiquettefor Success', 5$^{th}$ Edition, Pearson,**2013**.
6. Dalley D., Burton L. and Margaret G., 'Developing your Influencing Skills', Green Hall, 1$^{st}$ Edition, Universe of Learning LTD,**2010.**
7. Konarnira, 'Communication Skills for Professionals', 2$^{nd}$ Edition, PHI,**2011.**
8. Mitra B. K., 'Personality Development and Soft Skills', 1$^{st}$ Edition, Oxford Press,**2011**.
9. 'Soft Skill for Everyone', Butter Field, 1$^{st}$Edition, Cengage Learning India Pvt. Ltd., **2011**.
10. Francis Peters S.J., 'Soft Skills and Professional Communication', 1$^{st}$ Edition, McGraw HillEducation, **2011.**
11. John A., 'Effective Communication', 4$^{th}$ Edition, Pan MacMillan, **2009**.
12. Aubrey D., 'Bringing out the Best in People', 2$^{nd}$ Edition, McGraw Hill,**1999**.

# SEMESTER-II

## INTRODUCTION TO FOOD TECHNOLOGY–II

**Subject Code: BFOTS1-201**          **LTPC**                    **Duration:60Hrs.**
                                                         **3 1 0 4**

**Course Objectives:**
1.    To aware students about classification and post-harvest changes in fruits and vegetables.
2.    To familiarize them with compositional and nutritional aspects of animal foods.
3.    To enhance their knowledge about milk and milk products.
4.    To give them an overview of Indian spices and condiments.

**Course Outcomes:**
1.    Students become aware about various types and post-harvest changes in fruits and vegetables.
2.    Students become familiar with compositional and nutritional aspects of animal foods.
3.    Students gain knowledge about milk and milk products.
4.    Students get an overview about Indian spices and condiments.

### UNIT-I (16Hrs.)

**Fruits and Vegetables:** Classification of fruits and vegetables, general composition, enzymatic browning, names and sources of pigments, Dietary fibre**.**

**Postharvest changes in fruits and vegetables:** Climacteric rise, horticultural maturity, physiological maturity, physiological changes, physical changes, chemical changes, pathological changes during the storage of fruits and vegetables.

### UNIT-II (17Hrs.)

**Compositional, Nutritional and Technological aspects of Animal foods Flesh Foods** - Meat, Fish, Poultry

**Meat**- Definition of carcass, concept of red meat and white meat, composition of meat, marbling, post-mortem changes in meat- rigor mortis, tenderization of meat, ageing of meat.

**Fish**- Classification of fish (fresh water and marine), aquaculture, composition of fish, characteristics of fresh fish, spoilage of fish- microbiological, physiological, biochemical.

**Poultry**- Structure of hen's egg, composition and nutritive value, egg proteins, characteristics of fresh egg, deterioration of egg quality, difference between broiler and layers.

### UNIT-III (12Hrs.)

**Milk and Milk Products:** Definition of milk, chemical composition of milk, its constituents, processing of milk, pasteurization, homogenization. An overview of types of market milk & milk products.

### UNIT-IV (15Hrs.)

**Food Spices and Condiments:** Types and uses of spices and condiments, Chemical composition, Extraction, General processing, uses and special attributes of important Indian spices like pepper, cinnamon, clove, ginger, turmeric, cardamom, fenugreek and fennel, seasonings and condiments blends.

**Recommended Books**
1. ManayS.andShadaksharaswamiM.,'Foods:FactsandPrinciples',NewAgePublishers, **2004**.
2. Srilakshmi B., 'Food Science', New Age Publishers,**2002**.
**3.** Meyer L. H., 'Food Chemistry', New Age,**2004**
4. Kenneth F. et.al, edited-Vol-1, 2, ' The Cambridge World History of Food', Cambridge Univ.Press, **2000**.
5. Eastwood M., 'Principles of Human Nutrition', 2<sup>nd</sup> Edition Blackwell publishing,**2003**.

## PRINCIPLES OF FOOD PRESERVATION

| Subject Code: BFOTS1-202 | L T P C | Duration:60Hrs |
|---|---|---|
| | 3 1 0 4 | |

**Course Objectives:**
1. To make students familiar with food preservation and its history.
2. To provide them knowledge about preservation at low temperature.
3. To aware them about high temperature preservation techniques.
4. To teach them about preservative effects of drying and irradiation.

**Course Outcomes:**
1. Students become familiar with general methods of food preservation.
2. Students learn about effect of different food preservation methods on food quality.
3. Students become aware about chemical preservatives and their usage in foods.
4. Students get knowledge about effect of preservation methods on microbial degradation.

### Unit-I (11Hrs.)
**Introduction:** Historical developments of food preservation. Principles of Food preservation, Scope & its benefits.
**Chemical preservation:** Class I and Class II preservatives.

### Unit-II (16Hrs.)
**Preservation by low temperature:** Introduction, Freezing and Refrigeration, cold storage and freezing, freezing curve, changes during freezing, types of freezing; slow freezing, quick freezing, thawing, changes during thawing and its effects on food.

### Unit-III (16Hrs.)
**Preservation by high temperature:** Thermal processing, Sterilization, commercial sterilization, pasteurization, and blanching. boiling, canning, aseptic processing, thermal death time.

### Unit-IV (17Hrs.)
**Preservation by Drying:** Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), factors affecting rate of drying, normal drying

curve, Various types of driers used in food industry.

**Irradiation:** Units of radiation, Ultraviolet and ionizing irradiations, their effect on microorganisms & uses in food processing.

## Recommended Books

1. Desrosier N. W. and Desrosier J. N., 'The Technology of Food Preservation', CBS Publication, New Delhi,**1998**.
2. Paine F.A. and Paine H.Y., 'Handbook of Food Packaging', Thomson Press India Pvt Ltd, New Delhi,**1992**.
3. Potter N.H., 'Food Science', CBS Publication, New Delhi,**1998.**
4. RamaswamyHandMarcottM.,'FoodProcessingPrinciplesandApplications',CRCPress, **2006**.
5. Rao P.G., 'Fundamentals of Food Engineering', PHI Learning Pvt Ltd, New Delhi,**2010.**
6. Toledo R. T, 'Fundamentals of Food Process Engineering', Aspen Publishers,**1999.**

| ENVIRONMENTAL STUDIES |
|---|

**Subject Code: BFOTS1-203**  **L T P C**  **Duration: 45Hrs.**
**3 0 0 3**

### Course Objectives:

1. To aware students about environmental studies and judicious use of natural resources.
2. To make them realize their responsibilities towards natural resources.
3. To familiarize them with ecosystem and its importance.
4. To draw their attention towards problems arising due to environmental pollution.

### Course Outcomes:

1. Students become aware about environment and its protection.
2. Students become responsible towards the use of natural resources.
3. Students become familiar with ecosystem and its importance.
4. Students have fair knowledge to reduce environmental pollution.

### UNIT-I (11Hrs.)

The multidisciplinary nature of environmental studies, Natural Resources, Renewable and non- renewable resources: Natural resources and associated problems.

### UNIT-II (12Hrs.)

Forest Resources, Water Resources, Mineral Resources, Food resources, Energy resources, Land resources, Role of an individual in conservation of naturalresources.

### UNIT-III (12Hrs.)

Ecosystems, Concept of an ecosystem, Structure and function of an ecosystem, Introduction,

types, characteristic features, Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

## UNIT- IV (10Hrs.)

Environmental Pollution: Air pollution; Water pollution; Soil pollution.

### Recommended Books

1.  Sing Y.K., 'Environmental Science', New Age International Pvt, Publishers,Bangalore.
2.  Agarwal K.C., 'Environmental Biology', Nidi Publ. Ltd. Bikaner,**2001**.
3.  Erach B., 'The Biodiversity of India,' Mapin Publishing Pvt.Ltd.
4.  Brunner R.C., 'Hazardous Waste Incineration', McGraw HillInc.
5.  Clark R.S., 'Marine Pollution', Clanderson PressOxford.
6.  Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 'Environmental Encyclopedia',Jaico Publ. House, Mumbai, 1196p,**2001**.
7.  De A.K., 'Environmental Chemistry', Wiley EasternLtd.
8.  Down of Earth, Centre for Science and Environment.https://www.downtoearth.org.in/

## FOOD CHEMISTRY

**Subject Code: BFOTS1-204**        **L T PC**        **Duration: 60Hrs.**
                                               **3 1 0 4**

### Course Objectives:

1.  To introduce students with basic concepts and definition of food chemistry.
2.  To teach students about chemical properties of food constituents.
3.  To aware students about the chemical changes occurring in food due to its components.
4.  To familiarize students with the food flavors and flavor enhancers.

### Course Outcomes:

1.  Students get knowledge about the basic concepts of food chemistry.
2.  Students learn about chemical properties of all food constituents.
3.  Students become aware about chemical changes occurring in food during processing.
4.  Students become familiar with food flavors and flavor enhancers.

## UNIT-I (12Hrs.)

**Introduction to Food:** Definition and Composition.
**Water**: Structure of water and ice, Types of water, Sorption phenomenon, Water activity and packaging.

## UNIT-II (16Hrs.)

**Lipids:** Classification, Physical properties-melting point, softening point, specific gravity, refractive index, smoke, flash and fire point, turbidity point. Chemical properties- reichertmeissel value, polenske value, iodine value, peroxide value, saponificationvalue.
**Changes in fats and oils:** rancidity, lipolysis, flavor reversion, Fat Mimetics.

## UNIT-III (17Hrs.)

**Proteins**: Protein classification and structure, Nature of food proteins (plant and animal proteins). Properties of proteins (electrophoresis, sedimentation, amphoterism and denaturation),

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Functional properties of proteins, organoleptic, solubility, viscosity, binding gelation/ texturization, emulsification, foaming.

**Carbohydrates:** Classification and Functions (monosaccharides, oligosaccharides and polysaccharides), Modified celluloses andstarches.

## UNIT-IV (15Hrs.)

**Vitamin:** Importance and Stability, Water soluble &Fat soluble vitamins.

**Flavour:** Definition and basic tastes, Description of food flavours, Flavour enhancers.

## Recommended Books

1. Fennema O. R, 'Food Chemistry', 3rd Edition, Marcell Dekker, NewYork,**1996.**
2. Whitehurst R. J. and Law B. A., 'Enzymes in Food Technology', CRC Press,Canada,**2002.**
3. Wong Dominic W. S., 'Food Enzyme, Chapman and Hall, New York,**1995.**
4. Potter N.N. and Hotchkiss J. H, Food Science', 5thEdition., Chapman &Hall,**1995.**
5. DeMan J.M., 'Principles of Food Chemistry', AVI, NewYork,**1980.**

## LAB II INTRODUCTION TO FOOD TECHNOLOGY-II

**Subject Code: BFOTS1-205**          **L T P C**                                    **Duration:30Hrs.**

**0 0 4 2**

## Course Objectives

1. To familiarize students with different instruments used in food technology.
2. To aware them about the proximate analysis of different food products.
3. To make them understand the effect of pH and blanching on fruits and vegetables.
4. To teach them about the qualitative analysis of food.

## Course Outcomes:

1. Students become familiar with different instruments used in food technology.
2. Students learn about the proximate analysis of different food products.
3. Students determine the effect of pH and blanching on fruits and vegetables.
4. Students learn to analyze the food qualitatively.

### Practical's

1. Demonstration of the instruments used in food technology.
2. Determination of moisture content in different food samples.
3. Determination of ash content of different food samples.
4. Determination of TSS of ketchup by refractometer.
5. Determination of acidity of milk and juices.
6. To study the effect of blanching on vegetables.
7. Determination of specific gravity of oil and milk.
8. Determination of pH of food samples by pH meter.
9. Determination of saponification value and acid value.
10. Qualitative test for starch and protein.

| **LAB III PRINCIPLES OF FOOD PRESERVATION** |
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**Subject Code**: BFOTS1-206          **L TPC**          **Duration: 30Hrs**
                                       **0 0 42**

**Course Objectives:**

1.   To aware students about the quality assessment of processed food products.
2.   To prepare different food preserves with the use of sugar and salt.
3.   To teach them the effect of heat treatment on shelf life of food.
**4.**   To familiarize students about preservation of foods by oils and chemicals**.**

**Course Outcomes:**

1.   Students determine the quality of processed food products.
2.   Students prepare different food preserves with the use of salt and sugar.
3.   Students learn about the effect of heat treatment on shelf life of food.
4.   Students become familiar with processing steps of different food products.

**Practical's**

1.   Cut out analysis of canned foods.
2.   Preservation of fruits and vegetables by syruping and salting.
3.   Preservation by paraffining.
4.   Preparation of sauerkraut.
5.   To determine the adequacy of blanching on vegetables.
6.   To enhance the shelf life of eggs by oiling and pickling.
7.   To study the curing of meat.
8.   Preservative effect of honey and different concentrations.
9.   Preservation of fruits and vegetables by salt, oil and vinegar.
10.   Visit to food industry

## M.Sc. (Food Science and Technology) (1st Year)

**Total Contact Hours=27**            **Total Marks=700**            **Total Credits =23**

| Semester 1st | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| MFOT1-101 | Principles of Food Preservation | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-102 | Basic Food Microbiology | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-103 | Food Chemistry | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-104 | Food Analysis and Instrumentation Lab.-I | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| MFOT1-106 | Food Microbiology Lab.-II | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| Departmental Elective –I (Select any one) | | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-158 | Nutraceutical and Functional Foods | | | | | | | |
| MFOT1-157 | Nutrition and Health | | | | | | | |
| Open Elective –I (Select any one) | | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| Total | | 19 | 0 | 8 | 320 | 380 | 700 | 23 |

*Departmental Elective: Subject to the availability of teacher and minimum 10 students as per university guidelines.

**Open Elective: Student must choose open elective subject offered by other departments.

**Total Contact Hours=24**            **Total Marks=600**            **Total Credits =22**

| Semester 2nd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| MFOT1-206 | Basic Food Engineering | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-207 | Technology of Cereals and Millets | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-208 | Computer Fundamentals and Statistics | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-209 | Technology of Cereals and Millets Lab.-III | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| Departmental Elective –II (Select any one) | | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-258 | Technology of Beverages | | | | | | | |
| MFOT1-259 | Technology of Malting and Brewing | | | | | | | |
| Departmental Elective –III (Select any one) | | 4 | 0 | 0 | 40 | 60 | 100 | 4 |
| MFOT1-260 | Food Biotechnology | | | | | | | |
| MFOT1-261 | Food Additives | | | | | | | |
| Total | | 20 | 0 | 4 | 260 | 340 | 600 | 22 |

*Departmental Elective: Subject to the availability of teacher and minimum 10 students as per university guidelines.

After 2nd Semester the students will undertake an In-plant summer training of six weeks in industry/organization. The evaluation of training will be done in the fourth semester.

## M.Sc. (Food Science and Technology) (2nd Year)

**Total Contact Hours=25**  **Total Marks=700**  **Total Credits =23**

| Semester 3rd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **MFOT1-315** | Technology of Fruits and Vegetables | 4 | 0 | 0 | 40 | 60 | 100 | **4** |
| **MFOT1-311** | Unit Operations in Food Engineering | 4 | 0 | 0 | 40 | 60 | 100 | **4** |
| **MFOT1-312** | Food Packaging | 3 | 0 | 0 | 40 | 60 | 100 | **3** |
| **MFOT1-313** | Technology of Fruits and Vegetables Lab.-IV | 0 | 0 | 4 | 60 | 40 | 100 | **2** |
| **MFOT1-314** | Food Packaging Lab.-V | 0 | 0 | 4 | 60 | 40 | 100 | **2** |
| **Departmental Elective –IV (Select any one)*** | | 3 | 0 | 0 | 40 | 60 | 100 | **3** |
| **MFOT1-364** | Food Standards and Quality Assurance | | | | | | | |
| **MFOT1-363** | Technology of Pulses and Oil seeds | | | | | | | |
| **Open Elective –II (Select any one)*** | | 3 | 0 | 0 | 40 | 60 | 100 | **3** |
| **MFOT1-420** | **Dissertation*** | 0 | 0 | - | - | - | - | **2** |
| **Total** | | **17** | **0** | **8** | **320** | **380** | **700** | **23** |

*Departmental Elective: Subject to the availability of teacher and minimum 10 students as per university guidelines.
**Open Elective: Student must choose open elective subject offered by other departments.
***Thesis will continue in 4th Semester. Students will have to finalize the topic of research and its objectives in 3rd Semester.

**Total Contact Hours=31**  **Total Marks=500**  **Total Credits =22**

| Semester 4th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **MFOT1-415** | Technology of Egg, Meat, Fish and Poultry | 4 | 0 | 0 | 40 | 60 | 100 | **4** |
| **MFOT1-416** | Technology of Milk and Milk Products | 4 | 0 | 0 | 40 | 60 | 100 | **4** |
| **MFOT1-417** | Food Analysis and Instrumentation | 3 | 0 | 0 | 40 | 60 | 100 | **3** |
| **MFOT1-418** | Technology of Animal Products Lab.-VI | 0 | 0 | 4 | 60 | 40 | 100 | **2** |
| **MFOT1-419** | In Plant Summer Training Viva | 0 | 0 | 0 | 60 | 40 | 100 | **1** |
| **MFOT1-420** | Dissertation | 0 | 0 | 16 | Satisfactory/ Unsatisfactory | | | **8** |
| **Total** | | **11** | **0** | **20** | **240** | **260** | **500** | **22** |

**Overall**

| Semester | Marks | Credits |
|---|---|---|
| 1st | 700 | 23 |
| 2nd | 600 | 22 |
| 3rd | 700 | 23 |
| 4th | 500 | 22 |
| **Total** | **2500** | **90** |

# SEMESTER FIRST

## PRINCIPLES OF FOOD PRESERVATION

Subject Code: MFOT1-101         L T PC                    Duration: 60Hrs.
                                4 0 0 4

**Course Objectives:**
1. To impart basic knowledge of food preservation to the students.
2. To introduce them to the concept of food preservation.
3. To make them familiar with different techniques of food preservation.
4. To make them aware about the recent advances in food preservation.

**Course Outcomes:**
1. Students acquire knowledge about basics of food preservation.
2. Students become familiar about concepts of food preservation.
3. Students learn techniques of food preservation.
4. Students become aware about recent advances in food preservation.

### Unit-I (15 Hrs.)
Introduction and historical developments of food preservation.
**Principles of Food Preservation. Food Spoilage:** Microbial, physical, chemical and miscellaneous.
**Heat Preservation and Processing:** Thermal death curve, canning of foods, canning process, equipment, effect on food, aseptic processing.

### Unit-II (15 Hrs.)
**Dehydration:** Drying curves, water activity, drying process, types of dryers, dehydration effect in food.
Concentration: Technology of concentration, equipment, process, and changes in food during concentration.
**Intermediate Moisture (IM) Foods:** Principles, characteristics, advantages, and problems in developing new IM foods.

### Unit-III (16 Hrs.)
**Refrigeration Storage:** Requirements of refrigeration storage, changes in foods during refrigeration storage.
**Freezing and Frozen Storage:** Freezing curves, factors determining freezing rate, types of freezers, changes in food during freezing.
**Ionizing Radiation:** Source; equipment; mechanism of preservation, dose determination, effect on food.
**Microwaves:** Mechanism of heating, equipment and its effect on food.
**Household Preservation Methods**: Salt curing, oiling and smoking.
**Chemical Preservation:** types, uses and effects of class I and class II preservatives in foods.

### Unit-IV (14 Hrs.)
**Recent Methods in Food Preservation:** Pulse electric, ultrasound, infrared, high pressure, Ohmic heating, hurdle technology, nanotechnology in food processing.

**Recommended Books**
1. N.P. Norman and H.H. Joseph, 'Food Science', CBS Publishers & Distributors Pvt. Ltd., New Delhi, India.
2. W.C. Frazier and D.C. Westh off, 'Food Microbiology', Tata McGraw Hill Publishing Company Ltd., New Delhi, India.

3. M. Kalia and S. Sangita, 'Food Preservation and Processing', Kalyani Publishers, New Delhi, India.
4. B. Sivasankar,'Food Processing and Preservation', Prentice Hall of India Pvt. Ltd., New Delhi, India.
5. J.N. Desrosier and N.W. Desrosier, 'Technology of Food Preservation', CBS Publishers & Distributors Pvt. Ltd., New Delhi,India.
6. P. Fellows, 'Food Process Technology: Principles and Technology', CRC Press, Cambridge, England.
7. N. Khetarpaul, 'Food Processing and Preservation', Daya Publishing House, NewDelhi,India.

## BASIC FOOD MICROBIOLOGY

**Subject Code: MFOT1-102**　　　　**L T P C**　　　　　　**Duration: 60Hrs.**
　　　　　　　　　　　　　　　　　**4 0 0 4**

**Course Objectives:**
1. To impart knowledge about history of microbiology.
2. To study about different types of micro-organisms and the factors affecting their growth.
3. To make students aware about the techniques used for cultivation of micro-organisms.
4. To introduce students about relation of microbiology and public health.

**Course Outcomes:**
1. Students get knowledge about history of microbiology.
2. Students learn about different types of micro-organisms and factors affecting their growth.
3. Students become aware about techniques used for cultivation of micro-organisms.
4. Students acquire knowledge about relation of microbiology and public health.

### Unit-I (15 Hrs.)
**Microbiology:** Introduction, historical developments in food microbiology; prokaryotes and eukaryotes; classification of microorganisms- a brief account; sources of microorganisms in foods; microbial growth, growth curve; factors affecting growth-intrinsic and extrinsic factors controlling growth of microorganisms, microbiological criteria of foods and their significance.

### Unit-II (15 Hrs.)
Effect of food preservatives, heating process, irradiation, low temperature storage, chemical preservatives, high-pressure processing; water activity and hurdle technology on microbial growth.

### Unit-III (16 Hrs.)
**Foods Microbiology and Public Health:** Food poisoning, types of food poisonings, important features etc; bacterial agents of food borne illness, food poisoning by *clostridium, salmonella, E. coli, bacillus, staphylococcus* etc.; non-bacterial agents of food borne illness: poisonous algae, and fungi - a brief account, the HACCP system and food safety used in controlling microbiological hazards.

### Unit-IV (14 Hrs.)
Food spoilage and microbes of milk, meats, fish, fruits, vegetables and cereals, spoilage of canned foods; Indicators microorganisms, methods of isolation and detection of microorganisms; conventional methods; rapid methods (newer techniques) – immunological methods; fluorescent, antibody, radio immunoassay, principles of ELISA, PCR (Polymerized chain reactions).

**Recommended Books**
1. J.M. Jay, 'Modern Food Microbiology', CBS Publishers, New Delhi,India.

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2. G.J. Banwart, 'Basic Food Microbiology', CBS Publishers, New Delhi,India.
3. M.R. Adam and M.O. Moss, 'Food Microbiology', CRC Press,U.S.A.
4. B. Ray, 'Fundamental Food Microbiology', CRC Press, New York,U.S.A.
5. R.Y. Stanier, 'General Microbiology', Palgrave Macmillan, Dunfermline, UnitedKingdom.

## FOOD CHEMISTRY

| **Subject Code: MFOT1-103** | **L T P C** | **Duration: 60Hrs.** |
|---|---|---|
| | **4 0 0 4** | |

### Course Objectives:
1. To learn about the basics of food chemistry.
2. To make students aware about the chemistry of different food components.
3. To enhance knowledge of students regarding effects of processing on different components of food.
4. To give students an overview of scope and importance of food chemistry.

### Course Outcomes:
1. Students gain knowledge about basics of food chemistry.
2. Students become familiar to chemistry of food components.
3. Students understand the effect of processing on food components.
4. Students learn about the terminology, scope and importance of food chemistry.

### Unit-I (16 Hrs.)
**Food Chemistry:** Definition, scope and importance.
**Carbohydrates:** classification, physical and chemical properties of sugars, functional properties, and uses of pectic substances, gums and dietary fiber in food; browning reaction in food: enzymatic and non-enzymatic browning, their occurrence and applications in food; starches: functionality of starch in foods, gelatinization and retro-gradation of starches, modified starches, resistant starches.
**Vitamins:** Water and fat–soluble vitamins, use of vitamins in foods and their properties. Effect of processing on vitamins.
**Minerals of Foods:** Calcium, phosphorus, iron, copper, lead, zinc and arsenic.

### Unit-II (14 Hrs.)
**Proteins:** structures of protein and amino acids; physical, chemical and functional properties of proteins, functional properties of food proteins, modification of food protein in processing and storage and its implications, texturized, denaturation of protein, gel formation. Enzymes- sources, properties, role of enzymes in dairy, starch and sugar, juice/beverage, and meat industry.

### Unit-III (14 Hrs.)
**Lipids Classification, Properties**- lipolysis, auto-oxidation, rancidity and flavor reversion, thermal decomposition and effect of ionizing radiations; modification of fats and oils (hydrogenation andinter-esterification); role of food lipids in flavor; nutritional aspects of natural and modified fats; fatmimetics.

### Unit-IV (16 Hrs.)
**Plant Pigments:** Chlorophyll, anthocyanins and carotenoids, occurrence, structure, chemistry, functions and changes during processing.
**Essential Oils**: Occurrence, structure, biosynthesis, extraction of essential oils, uses in foods. Flavoring compounds in foods.
Allergens, toxic constituents and anti-nutritional factors of foods (enzyme inhibitors, trypsin and chymotrypsin inhibitor, amylase inhibitor, flatulence causing sugars, phytolectins).

**Recommended Books**
1. L.H. Meyer, 'Food Chemistry', Van Nostrand, Reinhold Comp Publications , , USA. New York,
2. C. Alias and G. Linden, 'Food Biochemistry', Ellis Horwood, New York,U.S.A.

3. Y. Pomeranz and R. Meloon, 'Food Analysis: Theory and Practice', Westport, An AVI Publication, New York, Sydney,Toronto.
4. R.O. Fennema, 'Food Chemistry', Marcel Dekker, New York,U.S.A.
5. L.H. Meyer, 'Food Chemistry', Van Nostrand, Reinhold Company Publication, NewYork, U.S.A.

## FOOD ANALYSIS AND INSTRUMENTATION LAB - I

**Subject Code: MFOT1-104**          **L TPC**          **Duration: 30Hrs.**
                                      **0 0 4 2**

**Course Objective:**
1. To develop an understanding of analytical and instrumental techniques used in food analysis.
2. To illustrate the principle and mechanism of analytical instruments.
3. To familiarise students about physical and chemical analysis of processed food.
4. To teach students about different preservation techniques.

**Course outcome:**
1. Students become aware about analytical and instrumental techniques.
2. Students learn about the principle and mechanism of analytical instruments.
3. Students become familiar with physical and chemical evaluation of processed foods.
4. Students understand different food preservation techniques.

## PRACTICAL

1. Analysis of given food sample for its moisture, fat, protein and ash contents.
2. Determination of vitamin C content in a given sample of citrus juice.
3. Estimation of calcium and phosphorus content in a given sample of food.
4. Calculation of iodine value and saponification value of given sample of fat or oil.
5. Estimation of tannins in a given sample of tea.
6. To study the process of Thin Layer Chromatography (TLC) to separate out various components in a given sample.
7. To estimate the amount of reducing sugars in a given food sample.
8. Calculation of smoke point, flash point and fire point of a given sample of vegetable oil.
9. Estimation of caffeine content in a given sample of coffee.
10. Determination of crude fiber content in given sample of vegetable/fruit.
11. Determination of non-reducing sugars, total sugars and starch in fruit sample.
12. Determination of total ash, acid insoluble and soluble ash in a given flour sample.
13. Estimation of rancidity in rancid oil/fat.
14. Detection of adulterants in oil/fat samples.
15. Estimation of Free Fatty Acids (FFA) in crude and refined oil sample.
16. Sensory analysis of various processed food products like jam, bread, and biscuit.
17. Determination of % age moisture, fat and curd content of Table Butter.

## FOOD MICROBIOLOGY LAB-II

**Subject Code: MFOT1-106**         **L T P C**              **Duration: 30Hrs.**
                                    **0  0  4 2**

### Course Objectives:
1. To make students familiar about different equipment's used for sterilization and disinfection.
2. To provide practical exposure about microbiological examination of different food products.
3. To provide knowledge about manufacturing of food products using desirable micro-organisms.
4. To teach students about isolation techniques of fungi.

### Course Outcomes:
1. Students become aware about the techniques of sterilization and disinfection.
2. Students learn to examining micro-flora of different food products.
3. Students come out with a strong practical handling in manufacturing of different products using micro-organisms.
4. Students become familiar with different techniques to isolate micro-organisms.

### PRACTICALS

1. Study of the different parts and use of laboratory microscope.
2. Preparation and sterilization of culture media, glassware.
3. Estimation of bacterial population in a given sample of food by Direct Microscopic Count (DMC)method.
4. Estimation of bacterial load of food sample by SPC (Standard Plate Count)method.
5. Insolation of pure culture of bacteria by pour plate and streak plate methods.
6. To study simple staining of bacteria.
7. To conduct Gram's staining of bacteria and differentiate between Gram +ve and Gram -ve bacteria.
8. Microbial analysis of cereals and cereal products such as wheat flour and biscuits.
9. Microbial analysis of spices (red chilies and coriander).
10. Detection of presence of *E. coli* and other *Coliform* bacteria in water by MPN and high coliform test.
11. Studies on the bacterial growth curve.
12. Estimation of total microbial count of:
    i) Surroundingair
    ii) Workers
    iii) Fruit and vegetable products
13. Isolation of bacteria by serial dilution technique.
14. To study various sub-culturing techniques.
15. To study about spawn preparation of mushroom.

## NUTRACEUTICAL AND FUNCTIONAL FOODS

Subject Code: MFOT1-158      **L T P C**          Duration: 60Hrs.
                                   **4 0 0 4**

### Course Objectives:
1. To make students aware about nutraceutical and functional foods.
2. To teach them the effects of nutraceuticals on different diseases.
3. To make them familiar with the chemistry of nutraceuticals.
4. To enlighten their knowledge about future prospects of nutraceutical foods**.**

### Course Outcomes:
1. Students become aware about nutraceutical and functional foods.
2. Students learn about the health benefits of nutraceutical foods
3. Students become familiar with chemistry of nutraceuticals.
4. Students know about various functional components of foods

### Unit-I (15 Hrs.)
Defining nutraceuticals and functional foods. Nature, type and scope of nutraceutical and functional foods.
Nutraceutical and functional food applications and their health benefits. Nutraceutical compounds and their classification based on chemical and biochemical nature with suitable and relevant descriptions.

### Unit-II (15 Hrs.)
Nutraceuticals for specific situations such as cancer, heart disease, stress, osteoarthritis, hypertension.
Antioxidants and other phytochemicals, (isoflavones, lycopenes), their role as nutraceuticals and functional foods.
Dietary fibers and complex carbohydrates as functional food ingredients.

### Unit-III (15 Hrs.)
Protein as a functional food ingredient.
Probiotic foods and their functional role.
Cereal products as functional foods – Oats, wheat bran, rice bran etc.

### Unit-IV (15 Hrs.)
Functional vegetable products, oil seeds and sea foods.
Coffee, tea and other beverages as functional foods/drinks and their protective effects. Stability of Nutraceutical compounds and estimation of their shelf life.

### Recommended Books
1. G. Mazza, 'Functional Foods: Biochemical and Processing Aspects', Techonomic Publication Lancaster, USA.
2. R.S. Kirk and R. Sawyer, 'Pearson's Composition and Analysis of Foods', Wesley LongmanInc. California,USA.
3. R.E.C. Wildman, 'Handbook of Nutraceuticals and Functional Foods', CRC Press, New York, U.S.A.
4. AOAC, 'Official Methods of Analysis', Association of Official Analytical Chemists,USA.

**Subject Code: MFOT1-157**          **L T P C**                    **Duration: 60Hrs**
                                     **4  0 0 4**

### Course Objectives:
1.   To aware students about relationship between food, nutrition and health.
2.   To teach students about the functions of food.
3.   To make them familiar about various food groups and balanced diet.
4.   To enhance their knowledge regarding digestion, absorption and function of various nutrients and their sources.

### Course Outcomes:
1.   Students understand the relationship between food, nutrition and health.
2.   Students gain knowledge about the functions of food.
3.   Students learn about various food groups and balanced diet.
4.   Students become familiar with the process of digestion and absorption of various nutrients.

### Unit-I (14 Hrs.)
**Foods and Nutrients:** Basic definitions, functions of food and nutrients, levels of status, changing concepts of nutrition.
**Energy:** Energy content of foods, physiological fuel value - review, measurement expenditure. estimating energy requirements of individuals and groups. regulation metabolism, control of food intake and weight.
**Energy Balance:** Food energy measure, energy control in human metabolism, basal metabolic rate (B.M.R.), factors affecting B.M.R., measuring B.M.R., energy requirements and its estimation.

### Unit-II (16 Hrs.)
**Nutrition and Weight Management:** Obesity and its causes, body composition, B.M.I., weight for height measures, health implications of obesity, problems of weight management.
**Glycaemia Index of Foods:** Control its importance.
Recommended dietary allowances (R.D.A.), ICMR standards, food guide, exchange lists, health promotion guidelines
**Carbohydrates:** Classification, dietary importance, Special functions of carbohydrates in body tissues, Relationship between dietary fiber and various health problems

### Unit-III (16 Hrs.)
**Fats:** Functions of EFA, role of ω-3, ω -6 fatty acids in health and disease. Trans fatty acids and prostaglandins, essential fatty acids, cholesterol, LDL and HDL and their health importance
**Proteins:** Nature and essentiality of amino acids and proteins, functions of protein, the concept of protein balance, comparative quality of food proteins, biological value, net protein utilization, protein efficiency ratio, therapeutic applications of specific amino acids
**Vitamins:** Clinical applications, sources, requirements and functions of vitamin A, D, E, K, C and 'B' complex, vitamins toxicity problems.

### Unit-IV (14 Hrs.)
**Minerals:** Minerals in human health, macro and micro minerals, trace minerals- functions, clinical applications, food sources and requirements
**Functional Foods:** concept and categories of functional foods and their importance Food security: problem and prospects.

**Recommended Books**

1. P. Insel, R.E. Turner and D. Ross, 'Discovering Nutrition', ADA, Jones and Bartlett Publishers Inc.,USA.
2. S.R. Williams, 'Essentials of Nutrition and Diet Therapy', Mosby Publishing, NewYork,U.S.A.
3. P.V.Hegartyand    V. Hegarty, 'Nutrition Food and the Environment', Eagen Press, United States.
4. A.F. Brian and G. Allen, 'Food Science, Nutrition & Health', Edward Arnold, A member of Hodder Headline Group London, Sydney,Auckland.
5. S.R.   MudambiandM.V.    Rajagopal, 'Fundamentals of Food & Nutrition'. New Age International (P) Limited, Publishers, New Delhi,India.
6. ICMR, 'Nutrient Requirement & RDA' ICMR, NewDelhi.
7. M.J. Gibney, M. Elia, O. Ljungqvist and J. Dowsett, 'Clinical Nutrition', The Nutrition Society Textbook Series, Blackwell PublishingCompany.

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# SEMESTER SECOND

<div align="center">**BASIC FOOD ENGINEERING**</div>

**Subject Code: MFOT1-206**     **L T P C**          **Duration: 60Hrs.**
                         **4  0  0 4**

**Course Objectives:**
1. To understand the principles of food engineering
2. To acquaint with fundamentals of various processes in food engineering
3. To understand the effects of various thermal and non-thermal processes on food quality.
4. To study the psychrometry and its use in food storage.

**Course Outcomes:**
1. Students understand the principles of food engineering.
2. Students become familiar with fundamental processes of food engineering.
3. Students become aware about the effects of various thermal and non-thermal processes on food quality.
4. Students acquire knowledge about psychrometry.

<div align="center">**Unit-I (15 Hrs.)**</div>

**Fundamental Concepts and Definitions:** Dimensions and units, thermodynamic systems (closed, open and isolated), intensive and extensive properties, equilibrium state, density, specific volume, specific weight, specific heat, enthalpy, entropy, pressure, temperature scales.

**Material Balances:** Basic principles, process flow diagrams, total mass balance, component mass balance, material balance problems involved in dilution, concentration and dehydration.

<div align="center">**Unit-II (15 Hrs.)**</div>

**Energy Balances:** Basic principles, energy terms, specific heat of solids and liquids, properties of saturated and superheated steam, heat balances.

**Fluid Flow Principles:** Fluid statics and dynamics, mass balance and energy balance, Bernoulli's equation, concept of viscosity, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Reynold's number.

<div align="center">**Unit-III (15 Hrs.)**</div>

**Heat Transfer:** Modes of heat transfer, conductive, convective and radiative heat transfer, thermal properties of foods, conductive heat transfer in a rectangular slab, tubular pipe and multilayered systems, estimation of convective heat transfer coefficient, forced convection and free convection, estimation of overall heat transfer coefficient

**Heat exchangers**: plate, tubular, scraped surface and steam infusion.

<div align="center">**Unit-IV (15 Hrs.)**</div>

**Thermal Process Calculations:** Commercially sterile concept, concept of D, F and Z values, reference F value, effect of temperature on thermal inactivation of micro-organisms, lethality function, thermal process calculation for canned foods. Calculation of processing time in continuous flow systems.

**Psychrometrics:** Properties of dry air: composition of air, specific heat of dry air, enthalpy of dry air and dry bulb temperature.

**Properties of Water Vapor:** specific volume of water vapor, specific heat of water vapour, Gibbs-Dalton law, Dew point temperature, relative humidity, humidity ratio, wet bulb temperature. Study of Psychrometric chart.

**Recommended Books**
1. R.P. Singh and D.R. Heldman, 'Introduction to Food Engineering', Academic Press, INC, London.
2. R.L. Earle, 'Unit Operations in Food processing', Pergamon Press Oxford,U.K.
3. R.T. Toledo, 'Fundamentals of Food Process Engineering', CBS Publishers, New Delhi, India.

4. J.C. Batty and S.L. Folkman, 'Food Engineering Fundamentals', John Wiley and Sons, New York,U.S.A.

## TECHNOLOGY OF CEREALS & MILLETS

**Subject Code: MFOT1-207**                  **L T P C**                  **Duration: 60 Hrs**
**4 0 0 4**

### Course Objectives:
1.    To familiarize students with the structure and composition of cereal grains.
2.    To impart knowledge about manufacturing process of different bakery products.
3.    To aware students about rice chemistry and milling.
4.    To introduce them with processing of corn and barley.

### Course Outcomes:
1.    Students become familiar with cereal chemistry and technology.
2.    Students learn about the manufacturing processes of different bakery products.
3.    Students become aware about milling of cereal grains.
4.    Students gain knowledge about cereal processing and their usage.

### Unit-I (15 Hrs.)
**Wheat Chemistry and Technology:** Structure and chemical composition of wheat grain. Criteria of wheat quality – physical and chemical factors. Wheat milling – general principles and operation; cleaning, conditioning and roller milling systems. Flour extraction rates and various flour grades. Criteria of flour quality. Enzymes of wheat and their technological significance.
**Dough rheology and its measurement**. Functionality of wheat proteins, carbohydrates, lipids and enzymes in bread making. Durum wheat- chemistry, quality and technology of pasta products.
### Unit-II (15 Hrs.)
Bread making processes, importance of critical unit operations, functions of ingredients/additives such as fat, emulsifiers, oxidants, reducing agents and conditioners. Bread faults and remedies. Technology of biscuit, cake, cookie and cracker manufacturing. Baking powders as leavening agents in bakery industry.
### Unit-III (16 Hrs.)
**Rice Chemistry and Technology:** Structure and chemical composition of rice grain, milling of rice–types of rice mill; huller mill, Sheller-cum-cone polisher mill. Modern rice milling unit operation-dehusking, paddy separation, polishing and grading. Factors affecting rice yield during milling. By-products of rice milling. Rice parboiling technology. CFTRI process of parboiling. Properties of parboiled rice, changes during parboiling. Advantages and disadvantages of parboiling. Cooking characteristics of rice. Rice convenience foods: precooked rice, canned rice, expanded rice, rice-based infant food formulae, rice cakes, rice noodles.
### UNIT-IV (14 Hrs.)
**Corn Technology:** Wet and dry milling of corn, products of wet and dry milling of corn, corn sweeteners and their uses.
**Malt Technology:** Malting of barley: steeping, germination and drying. Different types of malts and their food applications.
**Technology of Coarse Cereal Grains:** chemical, technological and milling aspects of sorghum, oats and millets.

**Recommended Books**

1.  A.M. Samuel, 'The Chemistry and Technology of Cereals as Food and Feed', CBS Publisher & Distribution, New Delhi,India.
2.  Y. Pomeranz, 'Wheat: Chemistry and Technology', American Association of Cereal Chemists, St. Paul, M N,U.S.A.
3.  A.C. Eliasson and K. Larsson, 'Cereals in Bread Making', Marcel Dekker. Inc. NewYork, U.S.A.
4.  R.C. Honeney, 'Principles of Cereal Science and Technology', American Association of Cereal Chemists, St. Paul,U.S.A.
5.  Y. Pomeranz, 'Advances in Cereal Science and Technology', American Association of Cereal Chemists, St. Paul,U.S.A.
6.  B.O. Juliano, 'Rice Chemistry and Technology', American Association of Cereal Chemists, St. Paul,U.S.A.
7.  J.M.V. Blanshard, P.J. Frazier and T. Galliard, 'Chemistry and Physics of Baking', Royal Society of Chemistry,London.
8.  A. Chakraverty, 'Postharvest Technology of Cereals, Pulses and Oilseeds', Oxford and IBH, New Delhi,India.
9.  S.C. Durbey, 'Basic Baking: Science and Craft', Gujarat Agricultural University, Anand (Gujrat).
10. N.L. Kent, 'Technology of Cereals', Pergamon Press, Oxford,UK.
11. R.H. Matthews, 'Legumes: Chemistry, Technology and Human Nutrition, CRC Press York, U.S.A
12. D.K. Salunkhe, S.S. Kadam, 'Handbook of World Food Legumes: Chemistry, processing and Utilization', CRC Press, Florida,U.S.A.

## COMPUTER FUNDAMENTALS AND STATISTICS

**Subject Code: MFOT1-208**　　　　　**L T P C**　　　　　　　**Duration: 60Hrs.**
　　　　　　　　　　　　　　　　　　**4 0 0 4**

**Course Objectives:**
1. To impart knowledge about the basic parts of computer and their working.
2. To teach students the number system.
3. To provide detailed knowledge of hardware and software used in computers.
4. To familiarize them with computer networks and software packages.

**Course Outcomes:**
1. Students got knowledge about the basics parts of computer.
2. Students learn about number system.
3. Students acquire knowledge of hardware and software used in computers.
4. Students become familiar with computer networks and software packages.

### Unit-I (15 Hrs.)

**Introduction of Computer:** Characteristics, classification of computer; block diagram of computer and overview of working.
**Number System:** Non-positional vs. positional number, binary, octal, decimal, hexa-decimal conversion of number system.

### Unit-II (13 Hrs.)

**Hardware:** Input, output, and secondary storage devices, central processing unit.
**Software:** Types of software; meaning, functions and types of operating system.

### Unit-III (17 Hrs.)

**Understanding Computer Networks:** Types; topologies for LANS, transmission media; analog and digital signals; network security.
**Working with Software Packages:** An introduction to PC-software packages; word processor-working with text, tables, checking spelling and grammar, printing a document; spreadsheet software-working with worksheet, formulas and functions, inserting charts; PowerPoint presentation-working with different views and designing presentation; window XP-working with files and folders, windows explorer.
**Lab.:** Windows explorer, MS-Word, MS-Excel, MS-PowerPoint and Internet Surfing.

### Unit-IV (15 Hrs.)

Methods of data collection, sampling and sampling methods, measurement of central tendency, mean, median, mode, standard deviation, standard error, variance. Correlation & regression analysis, analysis of variance (ANOVA), tests of significance, t-test, z- test and f- test.

**Recommended Books**
1. 'Introduction to Information Technology', Pearson Education, New Delhi,India.
2. P.Norton,'IntroductiontoComputers',TataMcGrawHillEducationPvt.Ltd.,NewDelhi, India.
3. D.E. Comer, 'Computer Networks and Internet', Pearson Education, New Delhi.India.
4. V.Rajaraman,'FundamentalsofComputers',PrenticeHallofIndia, NewDelhi,India.
5. 'Office 2000: No Experience Required', BPB Publications, New Delhi,India.
6. A.K.RayandT.Acharya,'InformationTechnology:PrinciplesandApplications', Prentice Hall of India, New Delhi,India.
7. A.S. Tanenbaum, 'Computer Networks', Eastern Economy Edn., PHI, New Delhi,India.

## TECHNOLOGY OF CEREALS LAB - III

**Subject Code: MFOT1-209**　　　　**L T PC**　　　　　　**Duration: 30Hrs.**
　　　　　　　　　　　　　　　　　　**0 0 4 2**

### Course Objectives:
1. To aware students about the techniques used to assess the quality of cereal grains.
2. To teach students about the proximate analysis of cereal grains.
3. To make them familiar about processes of making bakery products.
4. To provide knowledge about instruments used for measuring quality of cereals.

### Course Outcomes:
1. Students become aware about techniques used for assessing quality of cereal grains.
2. Students become familiar with various laboratory tests conducted in cereals.
3. Students acquire knowledge to quality control in cereal technology.
4. Students acquire knowledge of manufacturing of bakery products.

### PRACTICAL

1. Experimental milling of rice and assessment of presence of head rice yield, broken, immature kernels and degree of polishing.
2. Experimental parboiling of rice by different methods and evaluation of parboiled rice.
3. Determination of proximate analysis of wheat flour for moisture, ash, protein and fat contents.
4. Determination of wet gluten and dry gluten content of given sample of wheat Flour.
5. Determination of alpha-amylase activity in wheat flour by falling number apparatus.
6. Determination of amylose content of cereal and legume starches by iodine binding method.
7. Isolation of rice starch and its quantification.
8. Determination of different cooking parameters of various rice cultivars.
9. Determination of the alcoholic acidity of a given sample of wheat flour.
10. Study of pasting properties of corn starch by Rapid Visco Analyzer.
11. Study of thermal properties of different Cereal starches by Differential Scanning Calorimeter.
12. To compare different types of wheat flours by Polenshke test.
13. Determination of turbidity and percentage light transmittance of cereal starches
14. Determination of textural properties of cooked rice using Texture Analyzer.
15. Experimental baking of different baked products like biscuits, breads and cakes and their evaluation for different parameters.
16. Visit to milling and bakery industry.

## TECHNOLOGY OF BEVERAGES

**Subject Code: MFOT1-258**          **L T P C**          **Duration: 60Hrs**

                                     **4 0 0 4**

**Course Objectives:**
1.   To introduce students with different beverages.
2.   To familiarize students with manufacturing process of various alcoholic beverages.
3.   To aware students about the chemistry, production and processing of beverages.
4.   To provide knowledge about processing and packaging of bottled water.

**Objective Outcomes:**
1.   Students come to know about different types of beverages.
2.   Students become familiar with manufacturing process of alcoholic beverages.
3.   Students become aware about chemistry, production and processing of beverages.
4.   Students got knowledge about processing and packaging of bottled water.

### Unit-I (15 Hrs.)

**Beverages:** Definition, types, importance of beverages in our diets. Treatment of water for food industry.
**Technology of Alcoholic Beverages:** Wine, cider, brandy, perry, toddy, bear and whisky.

### Unit-II (16 Hrs.)

Manufacturing of carbonated beverages and technology of carbonation.
**Technology of soft drinks** : ingredients and additives used in production of soft drinks.
Citrus beverages, whey beverages and utilization of whey in development of fortified drinks, use of low calorie sweeteners in beverages.

### Unit-III (14 Hrs.)

Production, processing and chemistry of tea manufacturing and types of tea.
Production, processing, roasting and brewing of coffee, soluble coffee, decaffeinated coffee, monsoon coffee, coffee brew concentrate and chicory.

### Unit-IV (15 Hrs.)

Cocoa processing, cocoa beverages and chocolate.
Packaged drinking water- manufacturing processes, quality evaluation of raw and processed water, methods of water treatment, BIS quality standards of bottled water.

**Recommended Books**
1  D.K. Tressler and M.A. Joslyn, 'Fruit and Vegetable Juice Processing Technology', The AVI Publication Com., Inc.U.S.A.
2  N. Manay Shakuntala and M. Shadaksharaswamy, 'Foods: Facts and Principles', New Age Inter. Publishers, New Delhi,India.
3  N.F. Haard and D.K. Salunkhe, 'Postharvest Biology and Handling of Fruits and Vegetables',AVI Publishing Co. Westport,U.S.A
4  A.A. Kader, 'Postharvest Technology of Horticultural Crops', University of California Division of Agriculture and National Resources, California,U.S.A

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## TECHNOLOGY OF MALTING AND BREWING

**Subject Code: MFOT1-259**          **L T PC**          **Duration: 60 Hrs.**
                                      **4 0 0 4**

### Course Objectives:
1.  To familiarize students with composition and structure of barley.
2.  To introduce students with steps of malting of barley.
3.  To introduce students with steps of brewing of barley.
4.  To provide knowledge about beer manufacturing and its quality evaluation.

### Course Outcomes:
1.  Students become familiar with composition and structure of barley.
2.  Students learn about malting and brewing.
3.  Students become aware about quality aspect of malting and brewing.
4.  Students acquire knowledge about beer making.

### Unit-I (15 Hrs.)
**Barley:** Production and trade, composition and structure of barley. preparation and storage of barley for malting, suitability of different cereals for malting, characteristics of barley for malting and brewing, problem of dormancy and water sensibility. Steeping techniques, germination of barley, morphological, enzymatic and chemical changes during malting, role of gibberellic acid in malting, techniques of malting composition of malt, malting of wheat and other cereals. Kilning, changes during kilning, Kilning techniques.

### Unit-II (16 Hrs.)
Quality evaluation of malt, special malts, milling techniques. Significance of water quality in brewing process. Mashing: Changes during mashing, methods of mashing, treatment of cereals used as adjucts, properties and complications of using adjuncts of different sources. Filtration of wort and sparging. Spent grain: Composition and uses.

### Unit-III (15 Hrs.)
Techniques of wort boiling, changes during boiling, hops, selection of hops, acidification of mash, wort cooling, methods of fermentation, management of primary fermentation.
Lagering: objectives and techniques. Beer: Composition, filtration, racking, pasteurization and defects.

### Unit-IV (14 Hrs.)
**Application of Malt in Food:** baking, infant food etc. Quality control–malt specifications and test procedures. Brewing operations, constituents of hops. brewing adjuncts

**Beer Quality**–flavor, taste, alcohol content, chemical constituent etc. Head retention–factors affecting head retention. Haze formation.

### Recommended Books
1.  M.J. Lewis and T.W. Young 'Malting and Brewing Science Vol. I', Springer Science & Business Media,Germany.
2.  M.J. Lewis and T.W. Young 'Malting and Brewing Science Vol. II', Springer Science & Business Media,Germany.

## FOOD BIOTECHNOLOGY

**Subject Code: MFOT1-260**          **L T PC**          **Duration: 60 Hrs.**
**4 0 0 4**

**Course Objectives:**
1.    To introduce students with basics of biotechnology.
2.    To provide them knowledge about the use of biotechnology in food preservation.
3.    To aware them about protein engineering and its role in food.
4.    To give them detailed information about transgenic plants and animals.

**Course Outcomes:**
1.    Students learn about the basics of biotechnology.
2.    Students become familiar role of biotechnology in food.
3.    Students become aware about protein engineering and its role in food.
4.    Students acquire knowledge about transgenic plants and animals and their role in food production.

**Unit-I (15 Hrs.)**
**Introduction to Food Biotechnology:** basic principles of genetic engineering, improvement of the processing of various crops by genetic engineering, food safety.

**Unit-II (15 Hrs.)**
**Natural Antimicrobials for Food Preservation:** Phytoalexins, essential oils and their components, bacteriocins of Lactic acid bacteria, nisin, pediocinsetc, applications of bacetriocins in food systems. Aflatoxins - production, control and reduction using molecular strategy.

**Unit-III (15 Hrs.)**
**Protein Engineering in Food Technology:** Methods, applications of protein engineering (e.g. glucose isomerase, Lactobacillus beta-galactosidase and peptide antibiotic nisin).
Biotechnology and Food ingredients: biogums, fat substitutes, biocolors, organic acids and sweeteners.

**Unit-IV (15 Hrs.)**
Food Biotechnology and Intellectual property rights (IPR), benefits of securing IPRs; bioethics in food biotechnology.
**Transgenic Plants and Animals:** Their contribution to food production enhancement.

**Recommended Books**
1. B.H. Lee, 'Fundamentals of Food Biotechnology', VCH Publishers, New York,U.S.A.
2. M.P. Tombs, 'Biotechnology in Food Industry', Wiley-Blackwell, U.K.
3. D. Knorr, 'Food Biotechnology', Marcel Dekker, INC, New York,U.S.A.
4. A. Schwartzberg and A Rao 'Biotechnology & Food Process Engineering' Marcel Dekker, INC, New York.
5. I. Goldberg and R. Williams, 'Biotechnology and Food Ingredients', Springer Science &Business Media,Germany.
6. R.D. King and P.S.J. Cheetham, 'Food Biotechnology', Elsevier Applied Science,London.

## FOOD ADDITIVES

Subject Code: MFOT1-261          L T PC                    Duration: 60Hrs.

                                 **4 0 0 4**

**Course Objectives:**
1. To introduce students with various food additives.
2. To familiarize students with mode of action of various additives.
3. To teach students about importance of additives in food preservation.
**4.** To aware students about processing of different spices**.**

**Course Outcomes:**
1. Students acquire knowledge about food additives.
2. Students become familiar with mode of action of different additives.
3. Students learn about the importance of food additives in food preservatives.
4. Students become aware about processing of spices.

### Unit-I (14 Hrs.)

**Introduction to Food Additives:** General classification, types, uses, functions, legal aspects, risks and benefits.

**Preservatives:** Antimicrobial agents (types, mode of action and their application), antioxidants (types and mechanism of oxidation inhibition), anti-browning agents (types, functions and modeofaction).

**Chelating Agents and Sequestrants:** Types, uses and mode of action.

### Unit-II (15 Hrs.)

**Acidulants and pH Control Agents:** Types, uses and mode of action.

**Coloring Agents:** Synthetic food colorants, color chemistry, applications and levels of use, natural colorants, sources of natural color (plant, microbial, animal and insects), misbranded colors, color extraction techniques, color stabilization

**Flavoring Agents:** Flavors (natural and synthetic flavors), off flavor in foods, flavor enhancers, flavor stabilization, flavoren capsulation.

### Unit-III (16 Hrs.)

**Sweeteners:** Natural and artificial sweeteners, nutritive and non-nutritive sweeteners, properties and uses of saccharin, acesulfame-K, aspartame, corn sweeteners, invert sugar sucrose and sugar alcohols (polyols) as sweeteners in food products

**Emulsifiers:** Types, selection of emulsifiers, emulsion stability, functions and mechanism of action.

**Stabilizers:** Types, uses and functions.

### Unit-IV (15 Hrs.)

**Food Spices and Condiments:** Types and uses spices and condiments, composition extraction, general processing, uses and special attributes of important Indian spices like pepper, cinnamon, clove, ginger, turmeric, cardamom, fenugreek and fennel etc., seasonings and condiments blends

**Advances in Food Additives:** Classification, functions, safety aspects, recent advances with relevance to color, flavor enhancement, sweeteners and preservatives.

**Recommended Books**
1. A.L. Branen, 'Food Additives', Marcel Dekker Inc., New York,U.S.A.
2. J.W. Purseglove 'Spices' Longman Publishers, London,England.
3. D.R. Tainter and A.T. Grenis, 'Spices and Seasonings- A Food Technology Handbook', VCH Publishers, Inc., Hoboken,U.S.A.
4. J. Merory, 'Food Flavorings, Composition, Manufacture and Use', AVI Publishing Inc.,Westport, U.S.A.
5. K.T. Farrell 'Spices, Condiments and Seasonings', Springer,U.S.A.

# SEMESTER THIRD

## TECHNOLOGY OF FRUITS AND VEGETABLES

**Subject Code: MFOT1-315**          **L T PC**                    **Duration: 60 Hrs.**

**4 0 0 4**

**Course Objectives:**
1. To familiarize students with types of fruits and vegetables along with their nutritive value.
2. To teach them about maturity and changes during ripening of fruits and vegetables.
3. To aware students about different storage methods used for fruits and vegetables.
4. To provide them a detailed knowledge about value addition.

**Course Outcomes:**
1. Students become familiar with classification of fruits and vegetables.
2. Students gain knowledge about maturity and changes during ripening.
3. Students learn about the storage methods of fruits and vegetables.
4. Students get knowledge about value addition of fruits and vegetables.

### Unit-I (15 Hrs.)

Classification and nutritional value of fruits and vegetables. Pre-harvest factors influencing post-harvest physiology, post-harvest handling, physical and chemical techniques to increase the post-harvest life of fresh fruits and vegetables.
Physical and chemical indices of fruit maturity, ripening, bio-chemical changes during ripening, processing and storage.

### Unit-II (15 Hrs.)

Different storage methods for fruits and vegetables like modified atmospheric storage, cold storage, controlled atmospheric storage etc., Pre-processing operations; Washing, blanching, peeling, sorting/grading, peeling, blanching, coring, destoning. Minimal processing of fruits and vegetables, quality factors for processing, fruit product order (FPO).

### Unit-III (15 Hrs.)

Technology of jam, jellies, marmalades, specifications, role of pectin and theories of gel formation.
Technology for juice pressing, juice extraction and clarification, methods of bottling, enzymatic clarification and debittering of juices, fruit juice powders- preparation and packaging.
Fruit juice beverages, squash, cordial, crush, RTS, nectar, syrups, their types and production, blending of juices.
Technology of tomato products: Sauce, puree, ketchup and tomato paste
Fruit preserves, candied fruits, dehydrated fruits & vegetables and fruit leather

### Unit-IV (15 Hrs.)

Canning of fruits and vegetables, preparation of syrups and brines, spoilage of canned fruits and vegetables. Fermented vegetable products, By products from fruit and vegetable wastes.
**Mushroom Technology:** Types of edible mushrooms, processing of mushrooms.

**Recommended books:**
1. R.P. Srivastava and S. Kumar, 'Fruit and Vegetable Preservation and Practice', Bio-Green Books, New Delhi,India.
2. A.K.Thompson,'FruitandVegetables–Harvesting,HandlingandStorage',Blackwell Publishing, UK.
3. B. Pantastico, 'Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables', AVI Publishing Company, Inc., Westport,U.S.A.
4. W.V. Cruess, 'Commercial Fruit and Vegetable Products', Allied ScientificPublishers, Bikaner,India.

5. Girdharilal, 'Preservation of Fruits and Vegetables', ICAR, NewDelhi.
6. M.E. Dauthy, 'Fruit and Vegetable Processing', International Book Distributing Co. Lucknow,India.
7. L.P. Hamson, 'Commercial Processing of Vegetables', Noyes Data Corporation, New Jersey.

## UNIT OPERATIONS IN FOOD ENGINEERING

**Subject Code: MFOT1-311**      **L T P C**          **Duration: 60 Hrs.**

**4 0 0 4**

### Course Objectives:
1. To introduce students with material handling in food industries.
2. To provide them a detailed knowledge of different unit operations carried out in food industries.
3. To familiarize them with different equipment's used in food industry.
4. To aware them about the effects of unit operations on nutrient quality of food.

### Course Outcomes:
1. Students learn about material handling in food industries.
2. Students acquire knowledge about different unit operations.
3. Students become aware about different equipment's used in food industry.
4. Students become familiar with effects of unit operations on nutrient quality of food.

### Unit-I (15 Hrs.)
**Preliminary Unit Operations:** Material handling: Conveyors and elevators, types of conveyors and elevators.
**Cleaning:** Dry-cleaning; screening, aspiration and magnetic cleaning, wet cleaning; soaking, spray washing, ultrasonic washing, sorting and grading: methods, advantages of sorting and grading.

### Unit-II (15 Hrs.)
**Conversion Unit Operations**: Size reduction: Benefits, criteria for size reduction, size reduction of solid, fibrous and liquid foods.

**Mixing:** Mixing terminology, mixers for dry solids (tumbler and vertical screw mixers). mixers for high viscosity pastes (dough mixer), mixers for low viscosity pastes, effect of mixing on foods.
**Filtration:** Filtration terminology (feed slurry, filtrate, filter medium, filter cake), filtration equipments.

### Unit-III (15 Hrs.)
**Processing/Preservation Unit Operations:** High temperature operations: Pasteurization, pasteurizer and its functioning.
**Evaporation:** Single effect evaporator, multiple effect evaporators and plate evaporators, batch type pan evaporators, natural circulation, forced circulation, rising film, falling film and agitated thin film evaporators.
**Dehydration:** Terminology, dehydration systems; tray drier, tunnel drier, spray drier, fluidized bed drying, vacuum drying and drum driers.

### Unit-IV (15 Hrs.)
**Low Temperature Operations:** Refrigeration, components of refrigeration system, compressors, condensers and expansion valve, selection of refrigerant, cooling load, coefficient of performance, refrigerant flow rate.

**Freezing Systems**: Direct contact and indirect systems, freezing load calculations.
**Freeze Drying:** Conventional drying versus freeze drying, Basic principle, freeze dryer and its components

**Recommended Books**

1. R.P. Singh and D.R. Heldman, 'Introduction to Food Engineering', Academic Press, INC, London.
2. R.L. Earle, 'Unit Operations in Food processing', Pergamon Press, Oxford,U.K.
3. J.G. Brennan, J. R. Butters, N. D. Cowell and A. E. V. Lilley, 'Food Engineering Operations', Elsevier, New York, U. S.A.
4. J.C. Harper, 'Elements of Food Engineering', AVI, Westport, U.S.A.

## FOOD PACKAGING

**Subject Code: MFOT1-312**      L T P C          **Duration: 45Hrs.**
                           **3 0 0 3**

**Course Objective:**

1. To demonstrate the functions and types of packaging materials used in food packaging.
2. To understand and compare different types and characteristics of paper and plastic packaging materials.
3. To demonstrate the application of metals in food packaging.
4. To use and understand about different types of packaging.

**Course Outcomes:**

1. Students understand the different types of packaging materials.
2. Students will be able to compare and know about the application of paper and plastics in food packaging.
3. Students will come to know about the use of metals in food packaging.
4. Students acquire the knowledge of different types of packaging techniques.

### Unit-I (10 Hrs.)

Introduction to food packaging, primary food packaging and secondary packaging, factors involved in the evolution and selection of a food package, functions of food packaging. Packaging requirements of selected foods-cereals and snack food, beverages, milk and dairy products, poultry & eggs, red meat, frozen food, horticultural products.
**Safety Considerations in Food Packaging**: Food safety problems associated with package, package labeling and food safety, recycling of packaging materials.

### Unit-II (12 Hrs.)

**Paper and Paper Based Packaging Materials:** Types of paper (Kraft, bleached, greaseproof) paper products (paper bags, cartoons, drums and molded paper containers), functional properties of paper, testing of paper packaging materials.
**Plastic Packaging Materials**: Classification of polymers, functional and mechanical.
Properties of thermoplastic polymers, processing and converting of thermoplastic polymers (extrusion, blow molding, injection molding, compression molding, lamination and heat sealing).

### Unit-III (12 Hrs.)

**Metal Packaging Materials:** Functional properties of metal containers, tin plate containers - quality control tests, can manufacturing and protective coatings.
Glass packaging materials: Composition and manufacturing of glass containers, glass container nomenclature, mechanical and optical properties of glass containers, testing of glass containers.

**Aseptic Packaging of Foods:** Sterilization of packaging material, food contact surfaces & aseptic packaging systems, retort pouches.

## Unit-IV (11 Hrs.)

**Active Food Packaging:** Definition, physical and chemical principles involved.

**Edible Films and Coatings as Active Layer:** Concept, different edible films used, use of edible active layers to control water vapor transfer and gas exchange

**Oxygen Absorbents:** Classification and main type of oxygen absorbents, factors influencing the choice of oxygen absorbents, application of oxygen absorbents for shelf -life extension of foods, disadvantages of oxygen absorbents.

**Ethanol Vapor:** Ethanol vapor generator, uses of ethanol for shelf - life extension of foods, disadvantages of ethanol/vapor generators.

### Recommended Books

1. G.L. Robertson, 'Food Packaging: Principles and Practice', Taylor &Francis.
2. S. Sacharow and R.C. Griffin, 'Principles of Foods Packaging', Avi Publication Co. Westport,U.S.A.
3. A.S. Athalye, 'Plastics in Packaging', Tata McGraw Hill Publishing Co., New Delhi,India.
4. M.L. Rooney, 'Active Food Packaging', Blackie Academic & Professional, Glasgow,UK.
5. M. Bakker, 'The Wiley Encyclopedia of Packaging Technology', John Willey & Sons. Inc; New York,U.S.A.
6. 'Food Packaging Technology Handbook', NIIR Board, National Institute of Industrial Research, New Delhi,India.
7. R. Ahvenainen, 'Novel Food Packaging Techniques', CRC Press, U.S.A.
8. J. Han and J. Han, 'Innovations in Food Packaging', Elsevier Academic Press, U.S.A.
9. R. Coles, D.McDowell and M.J. Kirwan,'Food Packaging Technology', CRC Press, U.S.A.

## TECHNOLOGY OF FRUITS AND VEGETABLES LAB - IV

**Subject Code: MFOT1-313**           **L T P C**           **Duration: 30Hrs.**
                                       **0 0 4 2**

**Course Objectives:**
1. To familiarize students with different tests used to evaluate fruit juice quality.
2. To provide practical knowledge of manufacturing of fruit and vegetable products.
3. To aware them about sensory evaluation of the different products.
4. To guide them about the microbiological testing of processed products.

**Course Outcomes:**
**1.** Students become familiar with different tests to evaluate juice quality.
**2.** Students learn to manufacture different fruit and vegetable products.
**3.** Students acquire knowledge about sensory evaluation of different products.
**4.** Students gain knowledge about microbiological testing of processed products.

## PRACTICALS

1. Extraction of Juices of different fruit (citrus, pomegranate, apple)
    a. Evaluation of vitamin C content and
    b. Determination of pH
    c. Evaluation of browning time
    d. Determination of Acidity
    e. Cost evaluation of Juice
    f. Sensory evaluation of the products
    g. Shelf –life study
2. Preparation of jams (using different fruits)and
    a. Determination of pectin content
    b. Evaluation of Total Soluble Solids(TSS)
    c. Evaluation of sugars using lane eynon method
    d. Determination of pH
    e. Evaluation of acidity
    f. Sensory evaluation of the products
    g. Cost evaluation product prepared sensory evaluation & organoleptic test
3. Preparation of jelly and
    a. Estimation of Pectin content
    b. Determination of total soluble solids(TSS)
    c. Jelmeter test
    d. Checking for pH
    e. Checking of acidity
    f. Cost evaluation of product
    g. Microbiological analysis
    h. Sensory evaluation of the products
4. Preparation of marmalade (using different fruits)
    a. Jam Marmalade
    b. Jelly Marmalade

5. Preparation of preserves and candies
    a. Evaluation of TSS
    b. Determination of Endpoint
    c. Microbiological Analysis
    d. Evaluation of product cost
    e. Sensory evaluation of the products
6. Preparation of potato chips and
    a. Calculation of product dimension
    b. Determination of time-temp combination for product
    c. Study of the effect of anti-browning agents
7. Preparation of tomato products (Sauce, Ketchup, Soup, puree)for
    a. Evaluation of TSS
    b. Evaluation of pH
    c. Evaluation of acidity
    d. Cost evaluation
    e. Microbiological analysis
8. Pickling & fermented products
9. Preparation and shelf-life study of ready-to-serve beverages
10. Experimental studies on drying and dehydration of fruits and vegetables

## FOOD PACKAGING LAB - V

| Subject Code: MFOT1-314 | L TPC | Duration: 30Hrs. |
|---|---|---|
| | 0 0 4 2 | |

**Course Objectives:**
1. To teach students about identification of different types of packaging materials.
2. To familiarize the students with testing methods of packaging materials.
3. To make them aware about different techniques of packaging.
4. To provide the knowledge of manufacturing and coating of cans.

**Course Outcomes:**
1. Students learn about identification of different types of packaging materials.
2. Students become familiar with testing methods of packaging materials.
3. Students become aware about different types of packaging and their effect on shelf life of foods.
4. Students get knowledge about manufacturing and coating of cans.

### PRACTICAL

1. Designing of an ideal packaging material for different type of food products.
2. Identification of different packaging materials.
3. Testing of paper based packaging materials.
4. Equilibrium Relative Humidity (ERH) study of foods.
5. To study uniformity and amount of wax in wax paper for packaging of hygroscopic foods.
6. To study chemical resistance of plastic and paper packaging materials.
7. To study Water Vapor Transmission Rates (WVTR) of paper and plastic polymers.
8. Shelf life studies of packaged foods.
9. Study of grease resistance of paper, plastic laminates and aluminum foil for the packaging of fatty foods.
10. To perform various functional tests on corrugated fiberboard boxes.

11. Determination of Cobb value of different types of paperboard.
12. Shrink packaging of poultry products.
13. Aseptic packaging of different food products.
14. Vacuum packaging of dry powders.
15. Testing of glass containers for thermal shock resistance.
16. Determination of tensile strength and heat seal strength of different plastics.
17. To conduct drop and vibration tests on different types of corrugated fiberboard boxes.
18. Determination of tin coating weight and porosity of tin plate container.
19. Determination of lacquer coating in tin containers.
20. Study of manufacture of 2-piece and 3-piece metal cans.
21. Visit to paper manufacturing industry.

## FOOD STANDARDS AND QUALITY ASSURANCE

**Subject Code: MFOT1-364**          **L T P C**          **Duration: 60Hrs.**
                                     **3 0 0 3**

### Course Objectives:
1. To introduce students with concepts of food quality, safety and management.
2. To aware students about food adulteration and its evaluation.
3. To familiarise students with different laboratory practices.
4. To provide knowledge about the role of National and International agencies in food safety.

### Course Outcomes:
1. Students acquire knowledge about basic concepts of food quality and safety.
2. Students become aware about food adulteration and its evaluation.
3. Students become familiar with different laboratory practices.
4. Students become acquainted with the role of National and International agencies in food safety.

### Unit-I (15 Hrs.)
Introduction to concepts of food quality, quality control, quality control cycle, responsibilities of quality control department, food safety, Current challenges to food safety
Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents.

### Unit-II (15 Hrs.)
Principles of food quality assurance, total quality management (TQM), good manufacturing /management practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control, food safety management, applications of HACCP in food safety, concept of food traceability for food safety

### Unit-III (15 Hrs.)
**Microbial Quality Control:** Determination of microorganisms in foods by cultural, microscopic, physical, chemical methods. Statistical quality control in food industry, Sampling techniques

### Unit-IV (15 Hrs.)
Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI), Codex alimentarious commission, USFDA, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161, ISO 14000).

**Recommended Books**
1. R. Early, 'Guide to Quality Management Systems for the Food Industry', Blackie, Academic and Professional,London.
2. W.A. Gould and R.W. Gould, 'Total Quality Assurance for the Food Industries', CTI Publications Inc.Baltimore.
3. Y. Pomeraz and C.E. MeLoari, 'Food Analysis: Theory and Practice', CBS Publishers and Distributor, New Delhi,India.
4. F.L. Bryan, 'Hazard Analysis Critical Control Point Evaluations- A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage', World Health Organization,Geneva.
5. R. Kirk and R. Sawyer, 'Pearson's Composition and Analysis of Food', Longman Scientific and Technical,England.
6. 'Manuals of Food Quality Control, Additives Contaminants Techniques', Food and Agricultural Organization,Rome.
7. T.E. Furia, 'Regulatory Status of Direct Food Additives', CRC Press, Florida, U.S.A.

## TECHNOLOGY OF PULSES AND OIL SEEDS

| Subject Code: MFOT1-363 | L T P C | Duration: 60 Hrs. |
|---|---|---|
| | 3 0 0 3 | |

**Course Objective:**
1. To explain the importance of fats and oils in human nutrition.
2. To study the different physical, chemical and functional properties of oils and fats.
3. To familiarize the students with different extraction techniques of oil from oilseeds by various methods.
4. To provide knowledge about the processing and quality evaluation of pulses and oilseeds.

**Course outcomes:**
1. Students gain knowledge about importance fats and oils.
2. Students acquire the knowledge about physical, chemical and functional properties of oils and fats.
3. Students gain knowledge about extraction techniques of oil from oil seeds.
4. Students become familiar with processing techniques of pulses and oilseeds and estimation of their quality parameters.

### Unit-I (15 Hrs.)

Importance of fats and oils in human nutrition, Chemical, physical and functional properties of fats and oils.
Importance of oilseeds processing in India.

### Unit-II (15 Hrs.)

Commercial oil resources, basic processing of fats and oils - oil extraction, expeller pressing and solvent extraction, degumming, refining, bleaching, hydrogenation, fractional cystallization, inter-esterification, glycerolizes, molecular distillation, plasticizing and tempering. Preparation of protein concentrates and isolates and their use in high protein foods, fermented and traditional products.

### Unit-III (15 Hrs.)

Fat substitutes and mimetics.
Common pulses produced in the country. Soybean: processing and utilization.
Milling methods for pulses, home scale commercial and recent methods with equipment's.

**Unit-IV (15 Hrs.)**

Anti-nutrients in pulses and modes of elimination.

Main processing methods: Cooking, germination, sprouting, fermentation, roasting, puffing, frying and extrusion cooking etc.

Products from legumes and uses: Starch, flour, protein concentrates and isolates.

**Recommended Books**

1. R.J. Hamilton and A. Bharti, 'Fats and Oils: Chemistry and Technology', Applied Science, London.

2. D.K. Salunkhe, J.K, Chavan, R.N. Adsule and S.S. Kadam, 'World Oilseeds: Chemistry, Technology and Utilization', VNR, New York,U.S.A.

3. I.A. Wolf, 'Handbook of Processing and Utilization in Agriculture', CRC Press, Florida, U.S.A.

MRSPTU

# SEMESTER FOUR

## TECHNOLOGY OF EGG, MEAT, FISH AND POULTRY

**Subject Code: MFOT1-415**          **L T PC**          **Duration: 60 Hrs.**
                                     **4 0 0 4**

### Course Objectives:
1. To aware students about the scope of meat industry in India.
2. To teach them about the composition and nutritive value of meat.
3. To enlighten their knowledge regarding post mortem changes in meat and its effect on meat quality.
4. To make them familiar with various egg, meat and fish products.

### Course Outcomes:
1. Students come to know about the scope of meat industry in India.
2. Students get knowledge about composition and nutritive value of meat.
3. Students acquire detailed knowledge about the post mortem changes and its effect on meat quality.
4. Students become familiar with various egg, meat and fish products.

### Unit-I (15 Hrs.)
Status and scope of meat industry in India. Structure and physico-chemical properties of muscle. Meat: Composition and nutritive value, conversion of muscle into meat, environmental and animal production factors that affect meat quality, post mortem changes in meat, rigor mortis, cold shortening, pre-rigor processing.

### Unit-II (15 Hrs.)
Aging of meat, meat tenderization- natural and artificial methods. Properties of fresh meat-water holding capacity, color, palatability.

Cooking methods for meat.
Storage and preservation of meat: Chilling, freezing, curing, smoking, dehydration, canning. Spoilage of meat.

### Unit-III (15 Hrs.)
Restructured meat products, meat analouges.
Meat industry by products: Importance and applications.
**Fish:** Factors affecting quality of fresh fish, fish dressing, chilling, freezing, salting and canning of fish.
Manufacturing of fish oil, fish protein concentrate, fish meal. By-products of fish industry, their technology of utilization.

### Unit-IV (15 Hrs.)
**Egg:** Structure, composition, nutritive and functional properties.
**Quality of Egg:** Internal quality evaluation, egg candling, egg grading, microbial spoilage of eggs, preservation and storage methods for eggs.
Egg powder.
Packaging and transportation of eggs.
**Poultry**: Types, chemical and nutritive value of poultry meat, poultry dressing and slaughtering methods, preservation, grading and packaging of poultry meat.

### Recommended Books
1. W.J. Stadelman and J. Owen,'Egg Science & Technology', AVI Publishing Company, INC. Westport, U.S.A.
2. R.A. Lawrie and D. Ledward, 'Lawrie's Meat Science', Woodhead Publishers,UK.

3. G. Mead, 'Poultry Meat Processing and Quality', Woodhead Publishers,UK.
4. P.C. Panda, 'Text Book on Egg and Poultry Technology', Vikas Publishers, Chennai,India.

## TECHNOLOGY OF MILK AND MILK PRODUCTS

Subject Code: MFOT1-416          L T PC          Duration: 60Hrs.
                                 **4 0 0 4**

### Course Objectives:
1. To aware students about scope of dairy industry in India.
2. To give them an overview about composition of milk and its nutritive value.
3. To make them familiar about the various milk processing techniques.
4. To enrich their knowledge regarding manufacturing of various food products.

### Course Outcomes:
1. Students become aware about the scope of dairy industry in India.
2. Students get enlightened about composition of milk and its nutritive value.
3. Students become familiar about various milk processing techniques.
4. Students learn about the manufacturing procedures of various milk products.

### Unit-I (15 Hrs.)
**Dairy Industry in India:** Scope, strengths and opportunities for dairy industry.
**Milk**: Definition, composition and nutritive value, factors affecting composition of milk.
Physicochemical properties and nutritive value of milk.
**Liquid Milk Processing:** filtration/clarification, standardization, pasteurization (LTLT, HTST, UHT), homogenization.
Microbiology of milk

### Unit-II (15 Hrs.)
**Technology of Recombined and Reconstituted Milk:** Composition, process of manufacture, defects

**Technology of Condensed and Evaporated Milk:** process of manufacture, defects (their causes and prevention).
**Technology of Milk Powders (WMP, SMP):** process of manufacture, defects (their causes and prevention), instantization of milk powder.
**Technology of Indigenous Milk Products:** Dahi, butter, ghee, channa, paneer etc.

### Unit-III (15 Hrs.)
**Technology of Cheese:** Classification, composition, nutritive value, process of manufacture of cheddar, mozzarella, cottage and processed cheese, defects (their causes and prevention).
Technology of frozen milk products: process of manufacture, defects (their causes and prevention).

### Unit-IV (15 Hrs.)
**Milk and Milk Product Standards and Legislations in India:** Grading of milk and criterion of grading, reconstituted milk, synthetic milk.
**Membrane Processing of Milk:** types of membranes, applications of reverse osmosis, ultra filtration and microfiltration in dairy industry.
Milk adulteration, synthetic milk. By products of dairy industry and their utilization. Imitation dairy products.

### Recommended Books:
1. Sukumar, De 'Outlines of Dairy Technology', Oxford University Press,UK.
2. G. Smith, 'Dairy processing improving quality', Woodhead Publishers, New Delhi,India.

**MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA**

3. A.T. Andrews and J. R. Varley, 'Biochemistry of Milk Products' Woodhead Publishers, New Delhi, India.
4. R. Early, 'Technology of Dairy Products', Springer Science & Business Media, Germany.
5. R.P. Aneja, B.N. Mathur, R.C. Chandan and A.K. Banerjee, 'Technology of Indian Milk Products', Dairy India Publishers, New Delhi, India.

## FOOD ANALYSIS AND INSTRUMENTATION

**Subject Code: MFOT1-417**          **L T PC**          **Duration: 45Hrs.**
                                     **3 0 0 3**

**Course Objectives:**
1. To study about various instruments used in food analysis.
2. To acquire knowledge about the procedures of proximate analysis of food.
3. To make them familiar with sensory analysis of food.
4. To make them aware about various sampling techniques of food.

**Course Outcomes:**
1. Students gain knowledge about various instruments used in food analysis.
2. Students learn about the proximate analysis of foods.
3. Students become familiar with sensory analysis of food.
4. Students become aware of the sampling techniques used for food analysis.

### Unit-I (10 Hrs.)
Introduction to food analysis, types of samples and sampling techniques, storage and preservation of samples, expression of results.
**Proximate Analysis of Foods:** Principles of moisture, fat, protein, carbohydrates, crude fiber and vitamins in foods.

### Unit-II (10 Hrs.)
**Sensory Analysis of Foods:** Overview of the sensory principles and practices, selection and screening of the sensory panel, types of panel (trained, semi trained), methodology of sensory evaluation: discriminative tests: difference tests, paired comparison, duo trio, triangle; descriptive tests.

### Unit-III (12 Hrs.)
**Instrumentation in Food Analysis:** Principles, types and applications of spectroscopy, photometry, electrophoresis; chromatography and atomic absorption spectro photometry.

### Unit-IV (13 Hrs.)
**Instrumentation in Food Analysis:** Color measurement in foods; X-ray analysis of foods and its applications; mass spectroscopy; nuclear magnetic resonance (NMR); differential scanning calorimetry (DSC).
Refractometry and ultrasonic in food analysis; texture analysis in foods, sensory versus instrumental analysis of texture, rapid methods of microbial analysis; immunoassays methods.

**Recommended Books**
1. R.S. Kirk and R. Sawyer, 'Pearson's Composition & Analysis of foods', Longman Scientific and Technical, UK.
2. G.G. Birk, J.G. Herman and K.J. Parker, 'Sensory Properties of Foods', Applied Science, London.

## TECHNOLOGY OF ANIMAL PRODUCTS

**Subject Code: MFOT1-418**          **L T P C**          **Duration: 30 Hrs.**
                                      **0 0 4 2**

### Course Objectives:
1. To make students familiar with the basic tests of milk and milk products.
2. To aware them about the adulteration and microbiological testing of milk.
3. To aware students about egg and meat quality.
4. To teach students about manufacturing of different animal based food products.

### Course Outcomes:
1. Students gain knowledge about testing of milk.
2. Students become able to perform microbiological tests of milk and milk products.
3. Students get knowledge about egg and meat quality.
4. Students acquire knowledge about making different animal based food products.

### PRACTICALS

1. Determination of specific gravity, total solids (T.S) % and SNF (Solid not fat) % in the given milk sample.
2. Determination of percentage fat in the given sample of milk by Gerber centrifuge method.
3. Determination of titrable acidity (T.A.) and pH of milk.
4. Determination of added Urea in the given sample of milk.
5. Determination of added starch in the given sample of milk.
6. To conduct clot on boiling (COB) and Alcohol – Alizarin test for testing milk quality.
7. Determination of added water in a given sample of milk.
8. Preparation qualitative testing of milk products like Chhana, Khoa and Paneer, Icecream.
9. Determination of added preservatives, neutralizers in the given sample of milk.
10. Estimation of bacterial numbers in a given sample of milk by direct microscopic count in a given sample of milk.
11. Determination of microbiological quality of milk of MBR test.
12. To study dismantling, cleaning and assembling of HTST pasteurizer for milk.
13. Separation of cream by cream separator.
14. Visit to a milk collection/chilling and milk processing plant.
15. Determination of external and internal quality of poultry egg.
16. To study the effect of time, temperature on coagulation properties of egg.
17. Determination of time temperature condition on formation of iron sulphide in egg.
18. Preservation and evaluation of different egg products.
19. Preparation and evaluation of different egg products
20. Preparation of different types of meat products using different methods of preservation.
21. Visit to meat, fish and poultry processing industries.
22. Determination of tenderness and water holding capacity of different meat.

## MECHANICS-II

**Sub. Code: BMATS1-501**    **L T P C**    **Contact Hrs.: 60**
                             **3  1  0  4**

**Course Objectives:** The course will give introduction to Mechanics. This theory and its applications are an excellent example of how physics and mathematics work hand in hand to give a complete picture of the real problems.

**Course Outcomes:** The study of the laws of Mechanics started in Mechanics-II in Semester V will now be extended to the dynamical problems. Thorough understanding of dynamics is essential to understanding any modern development of Physical sciences.

### UNIT-I (12 Hrs.)

**Langrangian Dynamics:** Basic concepts, Constraints, Generalized coordinates, Holonomic and non-holonomic dynamical systems, Principle of virtual work, D'Alembert's principle, Langrange's equations from D'Alembert's principle,

Langrange's equations in presence of non-conservative forces, Generalized potential, Hamilton's principle and Derivation of Langrange's equations from it, Guage invariance of the Lagrangian.

### UNIT-II (18 Hrs.)

**Hamiltonian Dynamics:** Generalized momentum and cyclic coordinates, Conservation theorems, Hamiltonian function H and Conservation of energy, Hamilton's equations, Hamilton's equations in different coordinate systems, Hamiltonian dynamics, Principle of least action, Routhain.

### UNIT-III (16 Hrs.)

**Two-Body Central Force Problem:** Reduction of two-body central force problem to an equivalent one-body problem, Central force motion in a plane, Equations of motion under central force and First integrals, Differential equation of an orbit, Inverse square law of force, Kepler's laws of planetary motion and their deduction, Stability of orbit under central force, Virial theorem.

### UNIT-IV (14 Hrs.)

**Variational Principles:** Motivating problems of calculus of variations, Functional and its properties, Variation of Functional, Eular-Langrange's equations, Modified Hamilton principle, Variational principle, Lagrange's method of undetermined multipliers, Physical significance of Lagrange's multipliers.

**Recommended Textbooks/ Reference Books:**

1. John L. Synge and Byron A. Griffith: Principles of Mechanics 3rd Edition McGraw-Hill international, **2000**.

2. J C Upadhyay, 3rd Edition 'Classical-Mechanics' Himalaya Publication House,**2014**.

3. J. G. Chakraborty, and P R Ghosh, Advanced Analytical Dynamics, U.N. Dhur& Sons,**1982.**

4. F Chorltan, Textbook of Dynamics, Published by Van Nostrand NJ, **1967.**

5. Lev. D. Elsgolc: Calculus of Variations, Dover Publication, **2007.**

## MATHEMATICAL METHODS

**Sub. Code: BMATS1-502**  **L T P C**  **Contact Hrs.: 60**

**3 1 0 4**

**Course Objectives**: The course aims to provide students with adequate knowledge of methods to find exact or approximate solutions of their problems through various methods.

**Course Outcomes**: Having done this course the students will be at ease to find analytical/ semi analytical solution of their problems by suitable methods mentioned in this course.

### Unit I (18 hrs.)

**Fourier Series:** Dirichlet's conditions, Expansion of functions in the form of Fourier Series, Even and Odd functions, half range series, Complex Fourier Series, practical harmonic analysis.

### Unit II (14 hrs.)

**Fourier transforms:** Fourier integrals, Fourier transforms (finite and infinite), Inverse Fourier transforms, Parseval's identities, Convolution theorem.

### Unit III (18 hrs.)

**Laplace transforms**: Definition, Laplace transform of standard functions, Laplace transform of derivatives and integrals, Inverse Laplace transform, Convolution theorem, Unit step function, Application of Laplace transforms to boundary value problems.

### Unit IV (10 hrs.)

**Z - transforms:** Difference equations, Basic definition of Z transform, Z- transform of standard functions, Shifting rules, Initial and final value theorems, Inverse Z- transforms, Application of Z- transform to solve difference equations.

**Recommended Textbooks/ Reference Books:**

1. R. K. Jain & S.R.K. Iyengar: Advanced Engineering Mathematics (Narosa Publishing House), 2$^{nd}$ Edition, **2003**.
2. Sokolnikoff and Redheffer : Mathematics for Physics and Engineering, McGrawHill, 2$^{nd}$ Edition, **1966**.
3. Erwin Kreyszig : Advanced Engineering Mathematics (Wiley Eastern Limited), 8th Edition, **2006**.
4. George B. Thomas, Jr, Ross L. Finney: Calculus &Analytic Geometry, Pearson Publication, **2016.**

## DIFFERENTIAL GEOMETRY

**Sub. Code: BMATS1-503**  **L T P C**  **Contact Hrs.: 60**

**3 1 0 4**

**Course Objectives:** The course aims to introduce space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surfaces are explored.

**Course Outcomes:** To explain the concepts of differential geometry and its role in modern Mathematics, Apply differential geometry techniques to specific research problems in Mathematics.

### UNIT-I (14 Hrs.)

**Curves in Space:** Space curves, Path, Arc length, Tangent line, Contact of nth order of a curve and surface, Plane of curvature, Tangent plane at any point of the surface f(x,y,z)=0.The Principal normal and bi-normal, Definitions of curvature, Torsion and screw-curvature, Serret-Fernet Formulae, To find curvature and torsion of curve, Helices.

## UNIT-II (14 Hrs.)

Intrinsic equations, Fundamental theorems for space curves, the circle of curvature, Osculating sphere, Behaviour of curve in the neighbourhood of a point, Involute and Evolute.

## UNIT-III (16 Hrs.)

**Concept of a Surface and Fundamental Forms:** Concept and Definition of a surface, Curvilinear equations of the curve on the surface, Parametric curves, Tangent plane and normal, First and Second Fundamental Form, Derivatives of N, Weingarton equations, Angle between parametric curves, Direction coefficients, Angle between any two intersecting curves on the surface.

## UNIT-IV (16 Hrs.)

**Geodesics:** Geodesics, Differential equation of geodesics, Normal property of geodesics, Geodesics curvature, Gauss bonnet theorem, Torsion of geodesics, Geodesics on Geodesics parallel.

**Recommended Textbooks/ Reference Books:**

1.      D. Somasundaram, 'Differential Geometry: A First Course', Alpha Science Publishers, **2008.**

2.      S. Kobayashi and K. Nomizu, 'Foundations of Differential Geometry', Inter science Publishers, **1963.**

3.      D.T. Struik, 'Lectures on Classical Differential Geometry', Addison - Wesley, Mass, **1950.**

4.      Martin M. Lipschutz, 'Differential Geometry' Schaum's Outlines, McGraw Hill Education, **2012.**

5.      Taha Sochi, 'Introduction of Differential Geometry of space Curves' Createsapce    Independent Pub, McGraw-Hill Education, **2017.**

6.      C E Weatherburn, "Differential Geometry of Three Dimensions "Cambridge University   Press, **2016.**

## FINITE ELEMENT METHODS

**Sub. Code: BMATS1-504**                 **L T P C**                          **Contact Hrs.: 60**
                                                                 **3 1 0 4**

**Course Objectives:** To introduce the concept of finite element method for its applications in ODE, PDE and Time dependent problems.

**Course Outcomes:**

1) To obtain an understanding of the fundamental theory of the FEA method

 2) To develop the ability to generate the governing FE equations for systems governed by partial differential equations

3) To understand the use of the basic finite elements for structural applications using truss, beam, frame.

## UNIT-I (16 hrs.)

Introduction to finite element method: Variational methods: Rayleigh-Ritz's method, Galerkin's method, Least Square method and Collocation method, General description of the finite element method.

## UNIT-II (14 hrs.)

Finite element method for ODE: Finite Element Formulations for the solutions of ordinary differential equations, Calculation of element matrices, Assembly and solution of linear equations.

### UNIT-III (17 hrs.)

Finite element method for PDE: Finite Element formulations for the solutions of partial differential equations, Finite element method for Elliptic, Parabolic and Hyperbolic partial differential equations.

### . UNIT-IV (13 hrs.)

Application of finite element method: Finite element method in time dependent problem, Elasticity, Solid Mechanics and Stress strain behaviour of different structure.

**Recommended Textbooks/ Reference Books:**

1.      Logan, D. L., A first course in the finite element method, 6th Edition, Cengage Learning, **2016**.

2.      J.N. Reddy, "Finite Element Method"- McGraw -Hill International Edition.

   Bathe K. J. Finite Elements Procedures, PHI.

3.      Cook R. D., et al. "Concepts and Application of Finite Elements Analysis"- 4th Edition, Wiley & Sons, **2003**.

| MATLAB |
|---|

| Sub. Code: BMATS1-505 | L T P C | Contact Hrs.: 60 |
|---|---|---|
| | 3 1 0 4 | |

**Course Objectives:** Students will be able to integrates computation, visualization, and programming in an easy-to-use environment, being able to develop algorithms, Data analysis, exploration and visualization.

**Course Outcomes:** Able to use MATLAB for interactive computations, Able to generate plots and export this for use in reports and presentations, Able to program scripts and functions using the MATLAB development environment, Able to use basic flow controls (if-else, for, while).

### UNIT-I (12 hrs.)

Introduction to MATLAB , MATLAB software: Introduction, MATLAB window, command window , workspace ,command history ,basic commands ,operation with variables . Data Files and data types, Basic Mathematics: BODMAS RULES, Arithmetic operations, Mathematical and logical operators, solving arithmetic equations. Basic matrix operations.

### UNIT-II (18 hrs.)

Other Operations: trigonometric functions, complex numbers, fractions, real numbers Functions: Writing user defined functions, Built in Function, Function Calling, Return value, Types of functions, Global variables. M files: Working with script tools, Writing Script File, Executing script file, The MATLAB editor, Saving M file.

### UNIT-III (12 hrs.)

MATLAB Programming: Automating commands with Scripts, Writing programmes with logic and flow control, Writing functions, Control and conditional Statement programming. Loops and Conditional Statement: Control flow Conditional control: if , else , switch; Loop control- for, while, continue , break , programming termination – return.

### UNIT-IV (18 hrs.)

Symbolic Math in MATLAB: calculus: numerical integration, linear algebra, roots of polynomials, algebraic equations, differential equations, transforms (laplace and fourier), ODE. 2D Plots.

**Recommended Text Books/ Reference Books:**

1) Andrew knight, "Basics of MATLAB and beyond", Chapman and Hall/Crc,1st Edition **1999.**
2) Stephen .J. Chapman,MATLAB Programming for engineers`, 4th Edition, **2007**.
3) Brian.R.Hunt `A Guide To MATLAB`, 3rd Edition, **2014**.
4) RudraPartap Singh, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, **2010**.

## MATLAB LAB.

| **Sub. Code: BMATS1-506** | **L T P C** | **Contact Hrs.: 15** |
|---|---|---|
| | **0 0 2 1** | |

**Course Objectives:**

1) Understanding the MATLAB environment.
2) Being able to do simple calculations using MATLAB.
3) Being able to carry out simple numerical computations and analyses using MATLAB.

**Course Outcomes:** Upon successful completion of this course, the student should be able to:

1) Understand the main features of the MATLAB development environment
2) Design simple algorithms to solve problems
3) Write simple programs in MATLAB to solve scientific and mathematical problems

## EXPERIMENTS

To develop algorithms/ programming in MATLAB language for following:

1) Study of basic matrix operations
2) Solve linear simultaneous equations
3) Determine eigen value and eigen vector of square matrix
4) Euler's method and Modified Euler's Method
5) Picard Method
6) 4th order Runge – Kutta method
7) Determine roots of polynomial
8) Simpson's $1/3_{rd}$ and 3/8 rules for numerical integration
9) Trapezoidal Method

Note: At least eight must be performed from the list

**Recommended Textbooks/ Reference Books:**

(1) Andrew knight, "Basics of MATLAB and beyond", Chapman and Hall/Crc,1st Edition **1999**.
(2) Stephen .J. Chapman ,`MATLAB Programming for engineers`4th Edition **2007**.
(3) Brian.R.Hunt `A Guide To MATLAB`3rd Edition, **2014**.
(4) RudraPartapSingh ,Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, **2010**.

## LINEAR PROGRAMMING PROBLEM

**Sub. Code: BMATS1-601**          **L T P C**                    **Contact Hrs.: 60**
                                   **3  1  0 4**

**Course Objectives:** To introduce the basic concepts of linear programming among the students for its applications in solving optimization problems.

**Course Outcomes:** Formulate a linear programming problem from a real word problem and solve them graphically and using some computational procedure while employing some convex analysis. Introducing concept of duality in linear programming. Explain game theory concepts for scientific study of strategic decision making.

### UNIT-I (14 hrs.)

System of Linear Equations, Linear independence and dependence of vectors, Concept of basis, Basic feasible solution, Convex sets. Extreme points, Hyperplanes, Introduction and formulation of linear programming problem (LPP), Solution of LPP using graphical method: Unbounded solution, infeasible solutions.

### UNIT-II (15 hrs.)

Standard form of LPP, Slack, surplus and artificial variables, Optimal solution of LPP using Simplex, Big-M and two phase computational procedure, Exceptional cases in LPP i.e., Infeasible, unbounded, alternate and degenerate solutions.

### UNIT-III (16 hrs.)

Duality in Linear Programming: General Primal- Dual pair, Formulating a dual problem from primal problem, Duality theorems, Complementary slackness theorem, Duality and simplex method, Dual simplex method.

### UNIT-IV (15 hrs.)

Game Theory: Two person zero sum games, pure strategies (minimax and maximin principles), Game with saddle point, Mixed strategies: Game without saddle point, Rule of Dominance, Solution methods for games without saddle point: Graphical method, Linear programming method.

**Recommended Text Books/ Reference Books:**

1. G. Hadley: "Linear Programming", Narosa, Reprint, **2002**.

2. KantiSwarup, P.K. Gupta and Man Mohan, "Operations Research", 9th Edn., Sultan Chand & Sons, **2002.**

3. Hamdy A. Taha, "Operations Research-An Introduction", Prentice Hall, 9th Edition, **2010**.

4. Martin Osborne, "An Introduction to Game Theory", Oxford University Press, **2003**.

5. F.S. Hillier. G.J. Lieberman: "Introduction to Operations Research- Concepts and Cases", 9th Edition, Tata Mc-Graw Hill, **2010**.

6.S. D. Sharma,Himanshu Sharma, Operations Research: Theory, Methods and Applications KedarNathRamNath, **2010.**

## COMPLEX ANALYSIS

**Sub. Code: BMATS1-602**     **L T P C**          **Contact Hrs.: 60**
                              **3  1 0 4**

**Course Objectives:** The course aims to introduce the basic ideas of analysis for complex functions in complex variables which includes differentiability and geometrical representation of complex functions. The course also discuss the expansion of complex function in form of series.

**Course Outcomes:** The completion of the course will enable the students to understand the important concepts of analytic functions, their geometrical meaning and expansion in the form of series.

### Unit-1(14 HOURS)

Limits, continuity and derivatives of the function of complex variable, Analytic function, Necessary and sufficient conditions for analytic functions, Cauchy-Riemannequations,C-R equations in polar form.

### Unit-II(15 HOURS)

Harmonic functions, Conjugate functions, Applications of Milne Thomson Method, Application to flow problems, Stereographic projection

### Unit-III (15 HOURS)

Geometrical representation of $w = f(z)$, Standard Transformations, Bilinear Transformatios, Conformal transformations.

### Unit –IV (16 HOURS)

Expansion of f(z), Taylor's series, Laurent's Theorem, Zeros and singularities of analytic functions..

**Reference:**

1. Brown, James Ward, & Churchill, Ruel V. **(2014).**"*Complex Variables and Applications* (9th ed.)", McGraw-Hill Education, New York.
2. Bak, Joseph & Newman, Donald J. **(2010)**. "*Complex analysis* (3rd ed.)". Undergraduate Texts in Mathematics, Springer. New York.
3. Zills, Dennis G., & Shanahan, Patrick D. **(2003)**. "*A First Course in Complex Analysis with Applications"*. Jones & Bartlett Publishers, Inc.
4. "Higher Engineering Mathematics" B.S Grewal, KhannaPublishers,Edition 35<sup>th</sup>.

## MATHEMATICAL MODELLING

**Sub. Code: BMATS1-603**     **L T P C**          **Contact Hrs.: 60**
                              **3  1 0 4**

**Course Objectives:** To introduce the basic concepts of mathematical modelling and some basic models among the students for its applications in dealing with mathematical problems.

**Course Outcomes:** This course  introduced mathematical modelling, that is, the construction and analysis of mathematical models inspired by real life problems. This will present several modelling techniques and means to analyse the resulting systems**.**

### UNIT-I (15 hours)

Simple situations requiring Mathematical Modelling, The techniques of Mathematical modelling, Classifications and some characteristics of Mathematical Modelling, Limitations of Mathematical Modelling.Thomus Malthus Population Model, and Ecology models, Classical

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equations: Chebyshev Polynomials and their properties. Laplace, Heat, Wave equations, The Vibrating string.

## UNIT-II (15 hours)

Bessel's and Legendre's equations, orthogonal properties & recurrences relation, Generating Function. Laplace transform and inverse transform application to initial value problem up to second order.

## UNIT-III (16 hours)

Monte Carlo Simulation Modelling: simulating deterministic behaviour (area under a curve, volume under a surface), Generating Random Numbers: middle square method, linear congruence.

## UNIT-IV (14 hours)

Queuing Models: harbour system, morning rush hour, Overview of optimization modelling, Linear Programming Model: geometric solution algebraic solution, simplex method.

**Recommended Text Books/ Reference Books:**

1. "Mathematical Modelling", J.N.Kapur, New Age International (P) Ltd., Publishers Reprint **2003.**
2. TynMyint-U and LokenathDebnath, "Linear Partial Differential Equation for Scientists and Engineers, Springer", Indian reprint, **2006**.
3. "Mathematical Modelling", J.G. Andrews and R. R. Mclone (**1976**). Butterwerths London.
4. Frank R. Giordano, Maurice D. Weir and William P. Fox, "A First Course in Mathematical Modelling", Thomson Learning, London and New York, **2003**.
5. "Partial Differential equations of Mathematical Physics"-TynMyint-U.
6. "Mathematical Modelling Techniques", R. Aris (1**978**), Pitman.

## DISCRETE MATHEMATICS

**Sub. Code: BMATS1-604**      **L T P C**      **Contact Hrs.:60**
                              **3 1 0 4**

**Course Objectives:** The objective of this course is to make the students familiar with the basic concepts in Discrete Mathematics and Graph Theory.

**Course Outcomes**: Students will have knowledge of significant concepts of partial order relations, Recurrence relations, Boolean Algebra , Lattices and Graph Theory.

## UNIT-I (14 Hrs.)

Partial order relations, Chains and anti-chains, Pigeon hole principle, Principle of inclusion and exclusion, Analysis of algorithms-Time complexity. Complexity of problems, Discrete numeric functions and Generating functions.

## UNIT-II (16 Hrs.)

Recurrence relations and Recursive algorithms, Linear recurrence relations with constant coefficients. Homogeneous solutions. Particular solution.Total solution. Solution by the method of Generating functions.

## UNIT-III (16 Hrs.)

Boolean Algebra-Lattices as ordered sets and as Algebraic structures. Duality. Distributive and Modular lattices. Boolean lattices and Boolean algebras. Boolean functions and expressions. Prepositional calculus. Design and implementation of digital networks. Switching circuits.

## UNIT-IV (14 Hrs.)

Graph Theory: Graphs and Planar graphs-Basic concept. Biparitemultigraphs. Weighted graphs. Paths and circuits, Shortest paths. Eulerian and Hamiltonian trails and cycles. Travelling salesman problem. Planar graphs. Trees.

**Recommended Text Books/ Reference Books:**

1. C. L. Liu, "Elements of Discrete Mathematics", 2nd Edition, McGraw Hill, International Edition, Computer Science Series, **1986**.
2. Dr.Babu Ram, "Discrete Mathematics", Pearson Education India; First edition **2010.**
3. B A. Davey and H. A. Priestley, "Introduction to Lattices and Order", Cambridge University Press, Cambridge, **1990**.
4. Edgar G. Goodaire and Michael M. Parmenter, "Discrete Mathematics with Graph Theory", 2nd Edition , Pearson Education (Singapore) P.Ltd., Indian Reprint **2003**.

## FINANCIAL MATHEMATICS

**Sub. Code: BMATS1-605**          **L T P C**          **Contact Hrs.: 60**
                                   **3 1 0 4**

**Course Objectives** : The course explores fundamentals of mathematical finances through basic concepts and some important theories related to finance.

**Course Outcomes**: The financial mathematics course helps the students to learn the basic theories of economics and finance with their mathematical interpretation.

### Unit I (13 hrs.)

**Accumulation and discounting:** Term factor in quantitative analysis of financial transactions, Interest and interest rates, Accumulation with simple interest, Compound interest, Nominal and effective interest rates, Determining the loan duration and interest rates, The notion of discounting.

### Unit II (17 hrs.)

**Payment annuity streams**: Basic definitions, The accumulated sum of the annual annuity, Accumulated sum of annual annuity, Accumulated sum of annual annuity with interest calculation m times a year, Accumulated sum of p-due annuity, Accumulated sum of p-due annuity with p not equal to m and m not equal to 1, The present value of the ordinary annuity and also with interest calculation m times a year,  Relation between accumulated and present value of annuity

### Unit III(15 hrs.)

**Financial transaction yield**:  Absolute and average annual transaction yield, Tax and inflation accounting, Payment stream and its yield, Instant profit, Basic credit calculations.

## Unit IV(15 hrs.)

**Analysis of real Investments:** Introduction, Net present value, Internal rate of return, Payback period, profitability index, Model of human capital investment.

**Recommended Text Books/ Reference Books:**

1. A. A. Mitsel, "Basics of Financial Mathematics",Department of Higher Mathematics and Mathematical Physics,**2012**.

2. Mark S.Joshi, "The Concepts and practice of Mathematical finance", 2$^{nd}$ edition, **2014**.

3. A Fahim, "Introduction of Financial Mathematics",**2018.**

4. Giuseppe Campolieti and Roman N. Makarov "Financial Mathematics-A Comprehensive Treatment" ,CRC press,**2014.**

# INTEGRATED / DUAL DEGREE BCA-MCA (5 YRS.) SYLLABUS
## 2018 BATCH ONWARDS

| Semester 7th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1-701 | Advanced Information Management System | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-702 | Design and Analysis of Algorithms | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1-703 | Software Development Methodologies | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Department Elective-I (Select any one) | | | | | | | | |
| BMCAD1-711 | Multimedia Systems | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAD1-712 | Cyber Attacks | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAD1-713 | Agile Computing | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Software Lab | | | | | | | | |
| BMCAS1-704 | Software Lab-XIII (Based on BMCAS1—702) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| Total | | - | - | - | 220 | 280 | 500 | 18 |

| Semester 8th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BMCAS1 -801 | Theory of Computation | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAS1 -802 | Machine Learning | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Department Elective – II (Select any one) | | | | | | | | |
| BMCAD1-811 | Human Computer Interaction | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAD1-812 | Cyber Forensics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMCAD1-813 | Software Testing and Quality Assurance | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| Software Lab | | | | | | | | |
| BMCAS1-803 | Minor Project (Implementation & Execution) | 0 | 0 | 8 | 60 | 40 | 100 | 4 |
| BMCAS1-804 | Software Lab-XIV (Based on BMCAS1--802) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| Total | | - | - | - | 240 | 260 | 500 | 18 |

# INTEGRATED / DUAL DEGREE BCA-MCA (5 YRS.) SYLLABUS
## 2018 BATCH ONWARDS

| Semester 9th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BMCAS1-901** | Compiler Design | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BMCAS1-902** | Cloud Computing | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BMCAS1 -903** | Computer Based Optimization Techniques | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **Department Elective – III (Select any one)** | | | | | | | | |
| **BMCAD1-911** | Digital Image Processing | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BMCAD1-912** | Block Chain Technology | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BMCAD1-913** | Software Architecture and Design Patterns | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **Software Lab** | | | | | | | | |
| **BMCAD1-914** | Software Lab-XV (Based on BMCAD1-911) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BMCAD1-915** | Software Lab-XVI (Based on BMCAD1-912) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BMCAD1-916** | Software Lab-XVI (Based on BMCAD1-913) | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **Total** | | - | - | - | **220** | **280** | **500** | **18** |

| Semester 10th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BMCAS1-011** | Research and Publication Ethics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BMCAS1-012** | Project (Implementation & Execution) | 0 | 0 | 20 | 60 | 40 | 100 | 10 |
| **Total** | | - | - | - | **100** | **100** | **200** | **14** |

## ADVANCED INFORMATION MANAGEMENT SYSTEM

**Subject Code: BMCAS1-701**          **L T P C**          **Durations: 60 Hrs.**
                                       **3 1 0 4**

### Course Objectives and Expected Outcomes:
To learn the advanced concepts of database information and management and its implementation for assessment of understanding the course by the students.
After completion of this course, the students will be able to recover their databases, understanding of transaction processing in real life.

### UNIT-I (17 Hrs.)
**Transaction Processing and Concurrency Control Techniques**: Introduction to Transaction Processing, Properties and states of Transactions, Scheduling of transactions, Serializability of Schedules, Locking Techniques for Concurrency Control, Two phase locking techniques.
**Database Recovery Techniques:** Recovery Concepts, Recovery Techniques Based on Deferred Update, Techniques Based on Immediate Update.

### UNIT-II (15 Hrs.)
**Distributed DBMS:** Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in a DDBMS, Distributed transaction management, distributed concurrency control, distributed deadlock management, distributed database recovery.

### UNIT-III (14 Hrs.)
**Object-Oriented DBMS and NoSQL:** Advanced database applications, weakness of RDBMS, Next generation database systems, OODBMS perspectives, persistence, advantages and disadvantages of OODBMS, Object-oriented database design, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS.
**Need of NoSQL and Its Data Models:** Key- value data model, Document data model, Column family data model, Graph data models, CAP Theorem.

### UNIT-IV (14 Hrs.)
**Data Warehousing Concepts, OLAP and Data mining**: Evolution of data warehousing, data warehousing concepts, benefits and problems of data warehousing, comparison of OLTP systems and data warehousing, On-Line Analytical Processing, Introduction to data mining.

### Recommended Books:
**1**  Thomas Connolly, Carolyn Begg, "Database Systems", Pearson Education, 4th Edition, **2005**
**2**  Pramod J Sadalage and Martin Fowler, "NoSQL Distilled", Pearson, **2012**
**3**  Hoffer, Prescott, Mcfadden, "Modern Database Management", Pearson Education Asia, **2007**
**4**  Ivan Bayross, "SQL and PL/SQL", BPB Publication , 4th Edition, **2010**

## DESIGN AND ANALYSIS OF ALGORITHMS

**Subject Code: BMCAS1-702**          **LTP C**          **Durations: 60 Hrs.**

**3 1 0 4**

**Course Objectives and Expected Outcomes:**

The students will be taught to analyse the asymptotic performance of algorithms, Apply
Important algorithmic design paradigms and methods of analysis.

On completion of course, students will be able to:

- Analyse worst-case running times of algorithms using asymptotic analysis.
- Explain the different ways to analyse randomized algorithms
- Describe divide and conquer, greedy programming and dynamic programming paradigm.

### UNIT- I (17 Hrs.)

**Introduction to algorithm analysis:** Introduction to algorithms, Algorithm Specifications, performance analysis, case study on analysis of algorithms. Recursion and Induction: recursive procedures, induction proofs, proving correctness, recurrence equations, recursion.

**Randomized Algorithms:** Basic of Probability Theory, Description of Randomized algorithms, Identifying the repeated Elements, Partiality Testing, Advantages and Disadvantages of using randomized algorithms.

### UNIT-II (15Hrs.)

**Algorithmic Techniques:** Introduction to Brute Force, Greedy, Divide and Conquer, Dynamic Programming techniques.

**Linear Search Algorithm**: Performance analysis of linear search algorithm, Binary Search Algorithm, Performance analysis of Binary Search Algorithm

**Divide and conquer technique of problem solving:** Quick sort, Merge Sort and Selection Sort Algorithms and their Performance Analysis.

### UNIT- III (14 Hrs.)

**Greedy algorithms:** General Method, Case Study based on Greedy Algorithm (Knapsack Problem), Minimum cost Spanning Trees: Prim's algorithm, Kruskal's minimal spanning trees, Single source shortest paths, transitive closure and APSP problem.

### UNIT –IV (14 Hrs.)

**Dynamic Programming:** General Method, Multistage graphs, All Pair Shortest Paths, Optimal Binary Search Trees and String Editing.

**Intractable Problems:** Nondeterministic Algorithms, NP Hard and NP complete Problems, NP Hard Graph Problem (Travelling Salesman problem), NP Hard Scheduling Problems (Job Shop Scheduling).

**Recommended Books:**

1  Coreman, Leiserson & Rivest, 'Introduction to Algorithm, PHI Publication.
2  Donald Knuth, 'The art of Computer Programming' Pearson Education.
3  Mark Allen Weiss, 'Data Structures and Algorithm Analysis in C, Pearson Education

| SOFTWARE DEVELOPMENT METHODOLOGIES |
|---|

| Subject Code: BMCAS1-703 | LT P C | Durations: 60Hrs. |
|---|---|---|
| | 3 1 0 4 | |

**Course Objectives and Expected Outcomes:**
This course will enable you to develop a broad and critical understanding of all the processes for engineering high quality software and the principles, concepts and techniques associated with software development, an ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems.

On completion of course, students will be able to:

- A range of skills focused on the analysis of requirements, design, and implementation of reliable and maintainable software, with strong emphasis on engineering principles applied over the whole
  development lifecycle.
- An awareness of current research in software development, the analytical skills and research techniques for their critical and independent evaluation and their application to new problems.

## UNIT- I (17 Hrs.)

**Introduction to Software Engineering:** The evolving role of software, Changing Nature of Software, legacy software, Software myths A Generic view of process: Software engineering – A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal a team process models. Process models: The waterfall model, Incremental process

models, Evolutionary process models, specialized process models, The Unified process.

## UNIT- II (14 Hrs.)

**Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirement's elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioural models, Data models, Object models, structured methods.

## UNIT- III (14 Hrs.)

**Design Engineering**: Design process and Design quality, Design concepts, the design model, pattern-based software design. Creating an architectural design: software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow into software architecture. Software Design Approaches, Structured Analysis, Structured Design.

## UNIT- IV (15 Hrs.)

**Object Oriented:** Concepts and Principles, Object Oriented Analysis, Object Oriented Design, Modelling component-level design: Designing class-based components, conducting component level design, object constraint language, designing conventional components.

**User Interface Design:** Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation. Coding and Documentation.

**Recommended Books:**
**TEXT BOOKS:**
1. Software Engineering: A practitioner's Approach, Roger S Pressman, sixth edition. McGraw Hill International Edition, 2005
2. Software Engineering by Jibitesh Mishra, Ashok Mohanty. Pearson.

**REFERENCE BOOKS:**
1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, **2010.**
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, **2008**
3. Fundamentals of Software Engineering, Rajib Mall, PHI, **2005**
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, **2006.**
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, **2006.**
7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications, **2008.**
8. Software Engineering 3: Domains, Requirements and Software Design, D.Bjorner, Springer, International Edition.
9. Software Engineering Principles and Practice, Hans Van Vliet, **3rd edition, Wiley India edition.**
10. Introduction to Software Engineering, R.J. Leach, **CRC Press.**
11. Software Engineering Fundamentals, Ali Behforooz and Frederick J. Hudson, Oxford University Press, RP **2009**
12. Software Engineering Handbook, Jessica Keyes, Auerbach, **2003.**

## MULTIMEDIA SYSTEMS

| Subject Code: BMCAD1-711 | LT P C | Durations: 60 Hrs. |
|---|---|---|
| | 3 1 0 4 | |

**Course Objectives and Expected Outcomes:**
The objective of the course is to learn the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video, and audio content. It enables to learn about the significance of quality of service in multimedia networking.
After completion of this course, the students will be able to:
- Learn the basics of multimedia systems such as design issues, storage requirements and interchange standards.
- Understand and compare various file formats for audio and video.
- Analyze and evaluate the standard compression techniques for multimedia data.
- Learn and apply various networking protocols for multimedia communication and distributed multimedia systems.
- Apply different coding technique for solving real world problem
- Design interactive multimedia software and evaluate multimedia application for its optimum performance.

### UNIT-I (15 Hrs.)

**Introduction:** Multimedia and its types, Introduction to Hypermedia, Hypertext, Multimedia Systems: Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia.

**Multimedia Technology:** Multimedia Authoring Paradigms, Design Issues in Multimedia Applications, Standards for Document Architecture: SGML (Standard Generalized Markup Language), ODA (Open Document Architecture); Multimedia Standards for Document Interchange: MHEG (Multimedia Hypermedia Expert Group).

### UNIT-II (14 Hrs.)

**Storage Media:** Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers.

**Audio:** Basics of Digital Audio, Sample Rates, Bit Size, Nyquist's Sampling Theorem; Audio File Formats; Introduction to MIDI (Musical Instrument Digital Interface): Components of a MIDI System, Hardware Aspects of MIDI, MIDI Messages.

### UNIT- III (17 Hrs.)

**Images, Graphics and Videos:** Types of Color Models, Graphic/Image Data Structures, Graphic/Image File Formats, Types of Color Video Signals, TV Standards.

**Image Compression**: Types of Redundancies, Classifying Compression Algorithms, Basics of Information Theory, Entropy Encoding: Run-length Encoding, Pattern Substitution, Huffman Coding, Huffman Coding of Images, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques: Transform Coding, Frequency Domain Methods, Differential Encoding, Hybrid Coding: Vector Quantization, JPEG Compression.

**Audio Compression:** Simple Audio Compression Methods, Psychoacoustics Model, MPEG Audio Compression.

**Video Compression:** Intra Frame Coding (I-frame), Inter-frame (P-frame) Coding, H.261 Compression, MPEG Compression, MPEG Video, MPEG Video Bitstream, Decoding MPEG Video in Software.

### UNIT-IV (14 Hrs.)

**Multimedia Communication**: Building Communication Network, Application Subsystem, Transport Subsystem, QOS, Resource Management, Distributed Multimedia Systems.

**Recommended Books:**
1. Ralf Steinmetz and KlaraNahrstedt, Multimedia Computing, Communications and Applications, Pearson Education
2. Prabhat K. Andleigh, KiranThakkar, Multimedia System Design, PHI
3. Li, Drew, Multimedia Computing, Pearson Education
4. Fred Halsall, Multimedia Communications, Pearson Education
5. Parag Havaldar, Gerard Medioni, Multimedia Systems, Cengage LearningPublication

## CYBER ATTACKS

**Subject Code: BMCAD1-712**       **L T P C**             **Durations: 60 Hrs.**
                                    **3 1 0 4**

**Course Objectives and Expected Outcomes:**
The objective of the course is to understand terminology and mechanisms of launching attacks so as to devise effective defence strategies. This course covers awareness of various attack artifacts and malwares. Open source attack tools are analysed and case studies are prepared to know the attack trends and their impacts.
After completion of the course, students will be able to:

- To define cyber attack terminology and present various reports and trends.

- To illustrate modus-operandi of well known attacks and analyze their impacts.
- To introduce ethical hacking and demonstrate assessment and testing practices.
- To perform experimental analysis of various attack artifacts.
- To install various malwares, keyloggers and spying tools in experimental test bed environment and perform their analysis using penetration testing.
- To perform case study of various attack tools.

## UNIT-I (14 Hrs.)

**Introduction:** Cyber Threat, Definition of Cyber Crime, Classification, Current Threats and Trends, Diversity of Cyber Crime, Cyber Hate Crimes, Cyber Terrorism.

**Types of Cyber Attacks:** Denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks, Man-in- the-middle (MitM) attack, Phishing and spear phishing attacks, Drive-by attack, Password attack, SQL injection attack, Cross-site scripting (XSS) attack, Zero-day exploit, Eavesdropping attack, Malware attack, DNS Tunneling.

## UNIT-II (14 Hrs.)

**Ethical Hacking:** Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing.

## UNIT-III (17 Hrs.)

**Attack Artifacts:** Virus, Worm, Trojan horse, Rootkits, Botnet, Social Engineering: Types of Social Engineering, Social Engineering Targets and Defence Strategies, Logic Bomb, Time Bomb.

**Cyber Issues:** Window Password Hacking and Cracking, Steganography, Hiding Secret Message, Anonymous Call, Message and Email Header Analysis, Access Darknet or Darkweb Using TOR: Anonymous Browsing - Access Darknet or Darkweb Using TOR: Anonymous Browsing.

## UNIT- IV (15 Hrs.)

**Malware and Keylogger Analysis:** Malware Analysis and Investigation – Introduction to Malware – Static Malware Analysis - Mobile Phone Hacking & Penetration Testing - Introduction of Keylogger: Art of Spying.

**Tools and case study:** Various open source attack tools may be explored, exposure of various government sites to have information of latest trends in attacks, each student may be required to prepare a report on various attack incidents.

**Recommended Books:**
1. Erdal Ozkaya, Yuri Diogenes., Cybersecurity – Attack and. Defense Strategies, Packt Publishing 2018
2. Protecting National Infrastructure by Edward Amoroso. 2010, Elsevier, Cyber Attacks
3. Martti Lehto, Pekka Neittaanmäki. Cyber Security: Analytics, Technology and Automation edited., International Publishing Switzerland 2015

**Online Course:**
1. Cyber Threats and Attack Vectors by Greg Williams, Coursera
2. Introduction to Cyber Security Tools & Cyber Attacks by IBM, Coursera

## AGILE COMPUTING

**Subject Code: BMCAD1-713**          **LT P C**          **Durations: 60 Hrs.**
                                       **3 1 0 4**

**Course Objectives and Expected Outcomes:**
The main aim of this course is to understand the basic concepts of agile software process, to gain knowledge in the area of various Agile Methodologies and to know the principles of Agile Testing. After completion of this course, the students will be able to:
- Understand the practices and philosophies of agile methods.
- Analyze the tradeoffs in selecting a software engineering method.
- Understand the basic agile design principles.
- Define and extend the usage of scrum and extreme programming in software product development.
- Familiarize with various tools for agile project management.
- Understand about various testing methods used in Agile.

### UNIT-I (14 Hrs.)
**Introduction of Agile:** Goals/Manifesto and principles, Key Features, Challenges, Advantages and disadvantages, Agile usage, Agile Vs Traditional Software development (Waterfall), Agile Software Development lifecycle.
**Agile Design:** Agile Design Practices, Design smells and software rotting, SOLID Principles: SRP – The Single Responsibility Principle, OCP – the Open Closed Principle, LSP – The Liskov Substitution, DIP – The Dependency Inversion Principle, ISP – The Interface Segregation Principle.

### UNIT-II (17 Hrs.)
**Agile Methodologies**: Scrum: Overview of scrum theory, Scrum Team, Scrum Roles, The Sprint, Sprint Planning, Daily Scrum, Sprint review, Sprint retrospective, Scrum artifacts, Product back log, sprint backlog, Progress Monitoring. Extreme Programming (XP): Overview of XP, Concept, Values, Rules, Principles,
Scalability, Practices, Issues.

### UNIT-III (14 Hrs.)
**Agile Project Management:** Overview of Agile project management, Agile project management model: Overview of agile enterprise framework and agile delivery framework, Scaling and governing agile projects. Tools for Agile project management.

### UNIT–IV (15 Hrs.)
**Agile Testing:** Introduction to agile testing, Principles for testers, Overview of organizational challenges, The Agile testing Quadrants, Test Automation, The Agile lifecycle and its impact on testing, Types of testing in agile : TDD, BDD, Acceptance tests Exploratory testing, Risk based testing, Regression tests, Unit testing, Integration testing, system testing, Tools to support the Agile Tester.

**Recommended Books:**
1. West D. B.: Introduction to graph theory, Pearson Education Asia
2. Wilson R. J.: 'Introduction to graph theory', Pearson Education, Asia.

## SOFTWARE LAB-XIII (BASED ON BMCAS1—702)

**Subject Code: BMCAS1-704**          **L T P C**
                                       **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-702. Students are required to do at least 8 assignments based on the paper.

## THEORY OF COMPUTATION

**Subject Code: BMCAS1-801**      **LT P C**          **Durations: 60 Hrs.**
                                   **3 1 0 4**

**Course Objectives and Expected Outcomes:**
The student will study various types of Finite Automata, Understand the grammar and PDA for a given language and will understand the challenge for Theoretical Computer Science and its contribution
After completion of this course, the students would be able to:

- Discuss abstract model of computing machine through Turing Machine and its types.
- Draw to create modern techniques to solve NP completeness problems.
- Recognize whether a problem is decidable or undecidable.

### UNIT- I (17 Hrs.)

**Finite Automata:** Formal language, need for formal computational models, Non-computational models, Deterministic finite Automata, Non-deterministic finite Automata, Equivalence of NFA and DFA, 2-Way Finite Automata, Crossing sequences, Moore and Mealy Machine, Application of finite automata i.e., Lexical Analyzers, text editors.

### UNIT- II (14 Hrs.)

**Regular Expression and Languages**: Regular expression, Equivalence of finite Automata and Regular expressions, Conversion between regular expressions and finite Automata, Application of Regular Expressions, Lexical analysis, Finding pattern in text.

### UNIT- III (14 Hrs.)

**Regular Languages and Regular Sets**: Pumping lemma for regular sets, Applications of pumping lemma. Closure properties of regular language, The Myhill-Nerode Theorem, Minimization of finite Automata.
**Pushdown Automata**: Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context free grammar.

### UNIT- IV (15 Hrs.)

**Context Free Grammar and Languages**: Context free Grammars, Derivation Trees, Leftmost and rightmost derivations, Ambiguity, Parsing techniques for parsing of general CFG's, Properties of Context free Languages, Normal forms for context free grammars, The Pumping Lemma for context free Languages,
Closure properties of context free languages.
**Turing Machine (TM)**: One Tape, multi-tape, the notions of time and space complexity in terms of T.M. Construction of simple problems, Computational complexity.

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**Recommended Books:**
1   John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, 'Introduction to Automata Theory, Languages and Computation', 3rd Edn., Pearson, **2006.**
2   Daniel I.A. Cohen, 'Introduction to Computer Theory', 2nd Edn., Wiley, **2011**.
3   Adesh K. Pandey, 'Theory of Automata and Computation', S.K. Kataria & Sons, **2013**.
4   K.L.P. Mishra, 'Theory of Computer Science: Automata, Languages and Computation', 3rd Edn., Prentice Hall India Course Private Limited, **2006**.

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## MACHINE LEARNING

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**Subject Code: BMCAS1-802**          **L T P C**                              **Duration: 60Hrs.**
                                       **3 1 0 4**

**Course Objective and Expected Outcomes:**
The aim of this course is to introduce the students to the basic concepts and techniques of Machine Learning, develop skills of using recent machine learning software solving practical problems, to gain experience of doing independent study and research.
At the end of the course students should be able to design and implement machine learning solutions to classification, regression and clustering problems and be able to evaluate and interpret the result of the algorithms.

### UNIT- I (14 Hrs.)
**Supervised Learning:** Regression/Classification. Basic methods: Distance-based methods, Nearest Neighbours, Decision Trees, Naive Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods. Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

### UNIT- II (17 Hrs.)
**Unsupervised Learning:** Clustering: K-means/Kernel K-means. Dimensionality Reduction: PCA and kernel PCA. Matrix Factorization and Matrix Completion. Generative Models (mixture models and latent factor models). Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging and Random Forests).

### UNIT- III (15 Hrs.)
**Modeling and Estimation**: Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning. Scalable Machine Learning (Online and Distributed Learning).

### UNIT- IV (14 Hrs.)
**Learning:** Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference. Learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

**Recommended Books:**
1   Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, **2012**
2   Christopher Bishop, Pattern Recognition and Machine Learning, Springer, **2007**

# INTEGRATED / DUAL DEGREE BCA-MCA (5 YRS.) SYLLABUS
## 2018 BATCH ONWARDS

## HUMAN COMPUTER INTERACTION

**Subject Code: BMCAD1-811**          **L T P C**          **Duration: 60Hrs.**
                                       **3 1 0 4**

### Course Objectives and Expected Outcomes:
The objective of this course is to familiarize the students with the key areas, approaches, and developments in the field of Human Computer Interaction (HCI).
It aims to get the students think constructively and analytically about how to design and evaluate interactive technologies.
After the completion of this course, the students will be able to:

- Understand the need and importance of designing interactive products and examine various interaction devices.
- Illustrate and analyze user needs and formulate user design specifications.
- Learns various tools for graphics design and examine the interactive design process for developing HCI systems.
- Examine the Mobile ecosystem to enable the development of mobile applications and tools.
- Learn and apply various Windows characteristics features for designing interactive applications.

### UNIT-I (15 Hrs.)
**Introduction to Human Computer Interface** Importance of User Interface, History of Human Computer Interface, Importance of Good Design, Benefits of Good Design, Principles of User Interface Design.
**Interaction Devices**: Keyboard Keys, Function Keys, Pointing Devices, Speech Recognition, Handwriting Recognition, Speech Generation, Image Display, Video Display, Device Drivers.

### UNIT-II (14 Hrs.)
**Color and Content**: Why Colors, Color Uses, Choosing Colors, Possible Problems With Colors, Page Title, Headings, Text, Messages, Error Messages, Icons.
**Design Process**: Understanding How User Interact with Computers, User Interface Models, Design Methodologies, Designing an Interface, Process of Interaction Design.

### UNIT-III (17 Hrs.)
**Graphical User Interface:** Popularity of Graphics, Characteristics of Graphical User Interface, Concepts of Direct Manipulation, Graphical System Advantages and Disadvantages, Web User Interface Characteristics and Popularity.
**Device and Screen-Based Control**: Device Based Controls, Operable Controls, Text Entry/Read-Only Controls, Selection Controls, Combining Entry/Selection Controls, Other Operable Controls, Presentation Controls and Selecting Proper Controls.

### UNIT- IV (14 Hrs.)
**Mobile HCI**: Mobile Ecosystem: Platforms, Application Frameworks- Types of Mobile Applications: Widgets, Applications, Games – Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
**Windows:** Window characteristics, Components of Window, Window Presentation Styles, Types of Windows, Window Management.

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**Recommended Books:**

1  Dix A. et al., Human-Computer Interaction, Harlow, England: Prentice Hall, **2004.**
2  Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: Beyond Human Computer Interaction, 3rd Edition, Wiley, **2011.**

## CYBER FORENSICS

**Subject Code: BMCAD1-812**            **L T P C**            **Duration: 60 Hrs.**
                                        **3 1 0 4**

**Course Objectives and Expected Outcomes**:

The objective of the course is to enable the student to identify, analyze and remediate computer security breaches; and to teach students about the various forms of cybercrimes and fundamentals of cyber forensic technologies.

After completion of this course, the students will be able to:

- Understand the fundamentals of Cyber-crimes and analyze its impact on the society.
- Learn the techniques for investigating Cyber-crimes and procedures for collecting & preserving evidences.
- Examine the evidence collected and apply it for the reconstruction of past events.
- Understand the legal and ethical aspects of Cyber-crimes.
- Design and develop a security architecture for an organization.

### UNIT- I (17 Hrs.)

**Overview of Cyber Crime:** Nature and Scope of Cyber Crime, Types of Cyber Crime, Introduction to Cyber forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing malicious software.

**Computer Forensics Technologies**: Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems.

### UNIT- II (15 Hrs.)

**Types of Computer Forensics Systems**: Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Biometric Security Systems.

Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies, Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

### UNIT- III (14 Hrs.)

**Ethical Hacking**: Essential Terminology, Windows Hacking, Malware, Scanning, Cracking. Digital Evidence in Criminal Investigations: The Analog and Digital World, Training and Education in digital

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evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure,
 Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies.

### UNIT- IV (14 Hrs.)

**Identification of Data:** Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks, Router Forensics. Cyber forensics tools and case studies.
Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

### Recommended Books:

1    John R VACCA, Computer Forensics: Computer Crime Scene Investigation, Firewall Media , 2009 edition Reprint **2012.**
2    Bill Nelson, Amelia Phillips,Christopher Stuart Cengage, Guide To Computer Forensics And Investigations, Learning publications, latest edition.
3    Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners,, Latest Edition, Springer's
4    Kevin Mandia, Chris Prosise, Incident Response and Computer Forensics, Tata McGraw -Hill, New Delhi
5    Robert M Slade, Software Forensics, Tata McGraw - Hill, New Delhi.

## SOFTWARE TESTING AND QUALITY ASSURANCE

| Subject Code: BMCAD1-813 | L T P C | Duration: 60Hrs. |
|---|---|---|
| | 3 1 0 4 | |

### Course Objectives and Expected Outcomes:
The main of this course is to analyse different approaches to software testing and quality assurance and select optimal solutions for different situations and projects.
After completion of this course, the students would be able to:
* Conduct independent research in software testing and quality assurance and apply that knowledge in their future research and practice.
* Evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

### UNIT- I (14 Hrs.)

**Testing Principles:** Need of testing, Basic concepts–errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing, functional testing, performance testing, white box testing, black box testing, verification and validation.

### UNIT- II (15 Hrs.)

**Test Management**: Testing Life Cycle–Roles and activities, Test Planning, Develop test plan review, Test Cases design strategies. Black box approach: random testing, equivalence class partitioning and boundary value analysis.

White box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing.

## UNIT- III (17 Hrs.)

**Software Metrics**: Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness, What to measure–GOM technique, Control flow structure, product quality metrics – MTTF, defect density, customer problems, customer satisfaction, function point.

**Quality Assurance:** Quality concepts–quality, quality control, quality assurance, cost ofquality Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections, audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Ishikawa's Seven Basic Tools.

## UNIT- IV (14 Hrs.)

**Quality Standards:** Basic concept of–ISO 9000 & 9001, CMM, six sigmas. Development of CMM-CMM–Following KPAs: requirements management (RM), software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), process change management.

**Recommended Books:**

1. Kshirasagar Naik and PriyadarshiTripathy, 'Software Testing and Quality Assurance:Theory and Practice', 1stEdn., Wiley, 2008.
2. Jeff Tian, 'Software Quality Engineering: Testing, Quality Assurance, and Quantifiable, Improvement', 1stEdn., Wiley, 2005.
3. William E. Perry, 'Effective Methods for Software Testing: Includes Complete Guidelines, and Checklists', 3rdEdn., Wiley, 2006.
4. Glenford J. Myers, 'The Art Of Software Testing', 3rdEdn., Wiley, 2015

## MINOR PROJECT (IMPLEMENTATION & EXECUTION)

**Subject Code: BMCAS1-803**　　　　　**L T P C**
　　　　　　　　　　　　　　　　　　　**0 0 8 4**

Students are required to develop a minor project according to latest technology.

## SOFTWARE LAB-XIV (BASED ON BMCAS1-802)

**Subject Code: BMCAS1-804**　　　　　**L T P C**
　　　　　　　　　　　　　　　　　　　**0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-802. Students are required to do at least 8 assignments based on the paper.

## COMPILER DESIGN

**Subject Code: BMCAS1-901**          **L T PC**          **Duration: 60Hrs**.
                                        **3 1 0 4**

**Course Objective and Expected Outcomes:**
The objective of the course is to provide an understanding of the fundamental principles in
Compiler Design. Learn the process of translating a modern high-level language to executable code
required for compiler construction.
At the end of course students will be able to:

- Use modern tools and technologies for designing new compiler.
- Understand fundamentals of compiler and identify the relationship among different phases of the
  compiler.

### UNIT-I (14 Hrs.)

**Introduction to Compiling**: Compiler's v/s Interpreters, Phases of a Compiler, Cross- compiler, Compiler
Construction tools. One Pass-Compiler, Syntax definition.
**Parsing**: Predictive Paring, Design of a Predictive Parser, Symbol tables.

### UNIT- II (15Hrs.)

**Lexical Analysis**: Rote of Lexical Analyser, Specification and Recognition of Tokens, Finite Automata from
Regular Expression, Regular expression to a NFA.
**Syntax Directed Translation**: Syntax directed translation scheme, Quadruples, Triples, Indirect triples,
Constructing syntax trees, Bottom-up evaluation of S-attributed definitions, L attributed definitions.

### UNIT- III (17Hrs.)

**Syntax Analysis**: Rate of parsing, CFG, Top-down parsing, bottom up, Parse tree, Operator Precedence
Parsing, LR parsers, Using ambiguous grammar. Runtime Environment, Storage organization, storage
allocation strategies.

### UNIT- IV (14Hrs.)

**Code Generation**: Issue in design of code generator, Basic Block and flow graphs, Next-use Information,
DAG representation of basic blocks. Code Optimization: Peep optimization, Principal source of optimization,
Optimization of basic blocks. Introduction to Global DFA.

**Recommended Books:**
1. Allen. I. Holub, 'Compiler Design in C', Pearson Publications
2. M. Joseph, 'Elements of Compiler Design', Laxmi Publications
3. Randy Allen, Ken Kennedy, 'Optimizing Compilers for Modern Architectures: A Dependence-based
Approach', Morgan Kaufmann Publishers.
4. Steven S. Muchnick, 'Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers –
Elsevier Science, India.

## CLOUD COMPUTING

**Subject Code: BMCAS1-902**          **L T P C**          **Duration: 60Hrs.**
                                       **3 1 0 4**

**Course Objectives and Expected Outcomes**:
The main aim of this course is to understand the basic concepts Cloud Computing, to understand the taxonomy and types of Cloud Computing and to understand different hypervisors of Clouds for the

 Virtualization.
At the end of course students will be able to:
- Identify problems, and explain, analyze, and evaluate various cloud computing solutions.
- Attempt to generate new ideas and innovations in cloud computing.

### UNIT-I (14 Hrs.)
**Evolution of Cloud Computing**: Vision of Cloud Computing, Definition, Deployment models, Reference models, Benefits and Challenges to Cloud Computing, already using Cloud Computing; Electronic Faxing, Voice in the Cloud, Commerce in the Cloud, Distributed Hosting in the Cloud, Accounting and Online Banking in the Cloud, Cloud Computing Applications.

### UNIT- II (15 Hrs.)
**Cloud Service Providers and Cloud Vendor's**: IaaS Providers, PaaS Providers, SaaS Providers, Specialized Cloud Software Providers. Cloud Vendor's IBM, Amazon AWS, HP, Oracle.

### UNIT- III (17 Hrs.)
**Securing the Cloud:** Reliability, Availability and Security: FUDD Factor, DoS Attack, Trust, Standard and Vendor Selection, SAS70 and Cloud Computing, Cloud Security Alliance, SysTrust Certification, Cloud Audit.

### UNIT- IV (14 Hrs.)
**Demystifying the Cloud**: A Case Study using Amazon's Cloud Service, Using Amazon's S3 Functionality, moving a Simple Application to the Cloud; Step1, Move Static Content to S3, Step 2; Move Web Servers and Backend, Moving the database, Eucalyptus, Nimbula.

**Recommended Books**:
**1**  Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms' 1 st Edn., Wiley, **2011.**
2  David E.Y. Sarna, 'Implementing and Developing Cloud Computing Applications', 1 st Edn., CRC Press, **2011.**
3  Chris Wolf, Erick M. Halter, Virtualization: From the Desktop to the Enterprise, 1 st Edn., A Press, **2005**.
**4**  George Reese, 'Cloud Application Architectures: Building Applications and Infrastructure in the Cloud', 1st Edn., O'Reilly Publishers, **2009.**

## COMPUTER BASED OPTIMIZATION TECHNIQUES

**Subject Code: BMCAS1-903**          **LT P C**                              **Durations: 60Hrs.**
                                                        **3 1 0 4**

### Course Objectives and Expected Outcomes:

To well ground students in modelling skills that are the basis for computer-based optimization techniques, and they will be prepared to apply those skills to the efficient design, analysis, operation and control of complex systems.

After completion of this course students will be able:

- To create simple architecture for evolutionary algorithms.
- To have the knowledge of applying evaluation optimization technique to engineering applications.

### UNIT- I (17 Hrs.)

**OR models**: solving the OR Model, Introduction to Linear Programming, two-variable LP model, Graphical LP Solution, Graphical sensitivity Analysis, Simplex Method, Big M Method, Two Phase Method, Special cases in Simplex Method Application.

### UNIT- II (15 Hrs.)

**Duality and Sensitivity Analysis**: Definition of the Dual problem, Primal dual relationship, Additional Simplex Algorithm for LP, Post optimal or Sensitivity Analysis. Transportation Model, Transportation Algorithm, Assignment Model.

### UNIT- III (14 Hrs.)

**Networks Models:** Definition, Minimum spanning trees algorithms, Shortest Route Problem, Maximum flow Model, Minimum Cost Capacitors flow problem, PERT & CPM.

### UNIT- IV (14 Hrs.)

**Non-Linear Programming**: Unconstrained Algorithms, Direct search Method, Gradient Method, Constrained Algorithm, Separable programming, Quadratic Programming, Geometric Programming

### Recommended Books:

1. Kanti Swarup, "Operations Research"
2. N.G. Nari, "Operations Research"
3. Prem Kumar Gupta and D.S. Hira, "Operations Research"
4. S.D. Sharma, "Operations Research"
5. Goel and Mittal, "Operational Research"
6. V.K. Kapoor, "Problems and Solutions in Operations Research"

**DIGITAL IMAGE PROCESSING**

| Subject Code: BMCAD1-911 | L T P C | Duration: 60 Hrs. |
|---|---|---|
| | 3 1 0 4 | |

**Course Objectives and Expected Outcomes:**
The main aim of this course is to study the image fundamentals and mathematical transforms necessary for image processing, to study the image enhancement techniques, to study image restoration procedures and to study the image compression procedures.
After completion of this course, the students will be able to:
- Review the fundamental concepts of a digital image processing system.
- Analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration.
- Categorize various compression techniques.
- Interpret Image compression standards.
- Interpret image segmentation and representation techniques.

## UNIT-I (14 Hrs.)

**Introduction and Digital Image Fundamentals**: Digital Image representation, Fundamental steps in Image processing, Elements of digital Image processing, Sampling and quantization, some basic relationships like neighbor's connectivity, distance measure between pixels, Image geometry.

Image Transforms: Discrete Fourier transform, Some properties of two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT.

## UNIT-II (15 Hrs.)

**Image Enhancement:** Point Operations, Histograms, Spatial Domain methods, Frequency domain Methods, Enhancement by point processing, Spatial filtering, low pass filtering, High pass filtering, Homomorphic filtering, Colour image processing.
Image Restoration Degradation model, Algebraic approach to Restoration, Inverse filtering, Wiener Filter, constrained least square restoration, Interactive restoration, Restoration in spatial domain.

## UNIT-III (17 Hrs.)

**Image Compression**: Coding Inter-pixel and Psycho visual redundancy, Image Compression models, Error Free compression, Lossy Compression, Image Compression standards.
**Image Segmentation**: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region Orientation Segmentation, Motion based segmentation.

## UNIT-IV (14 Hrs.)

**Representation and Description**: Representation schemes like chain coding, Polygonal approximation, Signatures, Boundary Segments, Skeleton of region, Boundary Description, Regional descriptors, Morphology.
**Recognition and Interpretation**: Elements of Image Analysis, Pattern and pattern classes, Decision Theoretic methods, Structural methods, Interpretation.

**Recommended Books:**
1. A.K. Jain," Fundamentals of Digital Image Processing", Pearson Education.
2. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", AWL.

3. W. K. Pratt," Digital Image Processing".
4. Ramesh Jain, Brian G. Schunck, "Machine Vision", TMH.

## BLOCK CHAIN TECHNOLOGY

**Subject Code: BMCAD1-912**          **L T PC**          **Duration: 60 Hrs.**
                                       **3 1 0 4**

### Course Objectives and Expected Outcomes:

After successful completion of this course, students will be familiar with block chain and crypto currency concepts. Also, they can build their own application using the learned concepts.

After the completion of this course, the students will be able to:

- Describe emerging abstract models for Block chain Technology, the structure of a block chain and why/when it is better than a simple distributed database.
- Evaluate the setting where a block chain based structure may be applied, its potential and its limitations.
- Analyze various cryptography mechanisms and evaluate their role in block chain.

### UNIT-I (14 Hrs.)

**Introduction to Block Chain:** The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work ( PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake ( PoS) based Chains - Hybrid models ( PoW + PoS).

### UNIT-II (15 Hrs.)

**Overview to Cryptography**: Symmetric-key cryptography, Public-key cryptography, Digital Signatures, Hash functions, Elliptic curve cryptography, Basics for crypto currency, Application of Cryptography to Blockchain- Using hash functions to chain blocks, Digital Signatures to sign transactions, Using hash functions for Proof-of-Work

### UNIT-III (17 Hrs.)

**Introduction to Bitcoin**: Wallet, Blocks, Merkley Tree, Hardness of mining, Transaction verifiability, Anonymity, Forks, Double spending, P2P gateway, Mathematical analysis of properties of Bitcoin.

**Ethereum and Hyperledger**: Ethereum networks, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity language, decentralized applications using Ethereum. Solidity- Smart Contracts, Attacks on smart contracts, Hyperledger fabric, the plug and play platform and mechanisms in permissioned block chain.

### UNIT-IV (14 Hrs.)

**Security issues of Blockchain**: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand, and Sharding based consensus algorithms.

### Recommended Books:

1. Lecture Notes, Online: https://www.ee.iitb.ac.in/~sarva/bitcoin.html, An Introduction to Bitcoin, Vijayakumaran, Saravanan
2. Narayanan, Arvind, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction., Princeton University Press, 2016

3. Andreas O'Reilly, M. Mastering Bitcoin: Programming the Open Blockchain    Antonopoulos, <u>Media, Inc.,</u> <u>2017</u>

## SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

**Subject Code: BMCAD1-913**            **L T PC**                           **Duration: 60 Hrs.**
                                                   **3 1 0 4**

**Course Objectives and Expected Outcomes:**
This course will enable students to Learn How to add functionality to designs while minimizing complexity, What code qualities are required to maintain to keep code flexible, to Understand the common design patterns, to explore the appropriate patterns for design problems.
The students should be able to:
- Design and implement codes with higher performance and lower complexity.
- Be aware of code qualities needed to keep code flexible.
- Experience core design principles and be able to assess the quality of a design with respect to these principles.
- Capable of applying these principles in the design of object-oriented systems.
- Demonstrate an understanding of a range of design patterns. Be capable of
- comprehending a design presented using this vocabulary.
- Be able to select and apply suitable patterns in specific contexts.

## UNIT-I (14 Hrs.)
**Introduction:** Introduction to design pattern, describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. object-oriented development, key concepts of object-oriented design other related concepts, benefits and drawbacks of the paradigm.

## UNIT-II (15 Hrs.)
**Analysis a System:** Overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.

## UNIT-III (17 Hrs.)
**Design Pattern Catalog:** Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.
**Interactive systems and the MVC architecture:** Introduction, The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation, implementing undo operation , drawing incomplete items, adding a new feature , pattern based
solutions.

## UNIT-IV (14 Hrs.)
**Designing with Distributed Objects:** Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

**Recommended Books:**
**Text Books:**
1  Object-oriented analysis, design and implementation, brahma dathan, sarnath rammath, universities press,**2013**
2   Design patterns, erich gamma, Richard helan, Ralph johman , john vlissides, PEARSON Publication,**2013.**
**Reference Books:**
1. Frank Bachmann, RegineMeunier, Hans Rohnert "Patter n Oriented Software Architecture" –Volume 1, **1996.**
**2.** William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, **1998.**

## SOFTWARE LAB-XV (BASED ON BMCAD1-911)

**Subject Code: BMCAD1-914**              **L T P C**
                                          **0 0 4 2**

 This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAD1-911. Students are required to do at least 8 assignments based on the paper.

## SOFTWARE LAB-XVI (BASED ON BMCAD1-912)

**Subject Code: BMCAD1-915**              **L T P C**
                                          **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAD1-912. Students are required to do at least 8 assignments based on the paper.

## SOFTWARE LAB-XVI (BASED ON BMCAD1-913)

**Subject Code: BMCAD1-916**              **L T P C**
                                          **0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAD1-913. Students are required to do at least 8 assignments based on the paper.

## RESEARCH AND PUBLICATION ETHICS

**Subject Code: BMCAS1-011**         **L T P C**          **Duration: 60 Hrs.**
                                      **3 1 0 4**

**Course Objectives and Expected Outcomes:**
The aim of this course is to provide students with knowledge, general competence and analytical skills in Research Methodology and Research and Publication Ethics.
After completion of this course students will be able to equip themselves with ethical issues related to Research and Publication and build a strong foundation for future research work in a systematic manner by applying notions of Research Methodology.

### UNIT-I (14 Hrs.)
**Philosophy and Ethics** – Introduction to Philosophy; Nature and Scope; Branches of Philosophy.
**Ethics**-Need of Ethics; Ethics Vs. Moral; Meta Ethics; Prescriptive Ethics; Violation of Ethics; Principles.

### UNIT-II (15 Hrs.)
**Publication Ethics** -Introduction; Ethical issues in publication; types of publication misconduct; Ethics related to submission; Standard guidelines; conflict of interest; Appeals and Complaint;Plagiarism; Types of Plagiarism; Avoiding Plagiarism; Plagiarism detection software.
**Publication Misconduct:** FFP issues in Research; Subject specific Ethical issues.

### UNIT-III (17 Hrs.)
**Open Access Publishing** – Overview of Open Access Publishing; Types of Open Access Publishing; History of Open Access Publishing; Benefits; Features; Open Access publishing Licenses; SHERPA RoMEO-Copyrights and Open Access Self Archiving Policies; Journal finder tools.

### UNIT-IV (14 Hrs.)
**Databases and Research Metrics Online Databases for Research:** Introduction; characteristics of Online Databases; Types of Online Databases; Indexing databases; characteristics of Citation databases; need to use a citation database.
**Research Metrics:** Introduction; Types of Metrics-Author Level Metrics; Article Level Metrics; Journal Level Metrics; Impact Factor; Cite Score; SNIP; Quality indicators for a journal.

**Recommended Books:**
1. Dr. G.S Batra and Dr. Vishal Goyal, 'Research and Publication Ethics', D.P.S. Publishing House, **2021**.

## PROJECT (IMPLEMENTATION & EXECUTION)

**SubjectCode:BMCAS1-012**          **L T P C**
                                     **0 0 2 1**

Students are required to develop a major project according to latest technology.

**Course:** B.Sc. (Graphics and Web Designing) Programme

**Duration:** 3 Years

**Eligibility:** All those candidates who have passed the 10+2 or its equivalent examination in any stream conducted by a recognized Board / University / Council.

<div align="center">OR</div>

Those candidates who have passed their Matriculation examination AND have also passed three-year Diploma in any Trade from Punjab State Board of Technical Education & Industrial Training, Chandigarh or such Examination from any other recognized State Board of Technical Education, or Sant Longowal Institute of Engineering & Technology, Longowal.

Mode of admission:

1. Online Counselling based on 10+2 examinationmarks.
2. Manual    counselling for left over seats after Online Counselling.

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# MRSPTU B.SC. (GRAPHICS AND WEB DESIGNING)
## SYLLABUS 2021 BATCH ONWARDS

| Semester 1st | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BGWDS1-101 | Mathematics | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-102 | Fundamentals of Computer and IT | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-103 | Introduction to Scripting Languages | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-104 | Workshop on Desktop Publishing | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BGWDS1-105 | Introduction to Scripting Languages Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BGWDS1-106 | Fundamentals of Computer and IT Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BGWDS1-107 | English | 1 | 0 | 0 | 40 | 60 | 100 | 1 |
| BGWDS1-108 | English Practical/Laboratory | 0 | 0 | 2 | 30 | 20 | 50 | 1 |
| BGWDS1-109 | Human Values, De- addiction and Traffic Rules | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-110 | Human Values, De- addiction and Traffic Rules (Lab/ Seminar) | 0 | 0 | 1 | 25 | --** | 25 | 1 |
| BGWDS1-111 | Mentoring and Professional Development | 0 | 0 | 1 | 25 | --** | 25 | 1 |
| Total | | 13 | 0 | 16 | 460 | 440 | 900 | 22 |

**The Human Values, De-addiction and Traffic Rules (Lab/ Seminar) and Mentoring and Professional Development course will have internal evaluation only. (See guidelines at the last page of this file)

| Semester 2nd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Subject Code | Subject Name | L | T | P | Int. | Ext. | Total | |
| BGWDS1-201 | Fundamentals of Statistics | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-202 | Concepts of Website Designing and Development | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-203 | Object Oriented Programming using C++ | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BGWDS1-204 | Object Oriented Programming using C++ Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BGWDS1-205 | Fundamentals of Statistics Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BGWDS1-206 | Workshop on Digital Image Editing | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BGWDS1-207 | Environmental Studies | 3 | 0 | 0 | 40 | 60 | 100 | 3 |

| BGWDS1-208 | Mentoring and Professional Development | 0 | 0 | 1 | 25 | --** | 25 | 1 |
|---|---|---|---|---|---|---|---|---|
| **Total** | | **12** | **0** | **13** | **365** | **360** | **725** | **19** |

| Semester 3rd | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BGWDS1-301** | Data Structures | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-302** | Elements of Design | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-303** | Database Management Systems | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-304** | Data Structures Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BGWDS1-305** | Elements of Design Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BGWDS1-306** | Database Management Systems Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BGWDS1-307** | Image Editing & Photography | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-308** | Image Editing & Photography Laboratory | 0 | 0 | 2 | 20 | 30 | 50 | 1 |
| **BGWDS1-309** | Mentoring and Professional Development | 0 | 0 | 1 | 25 | --** | 25 | 1 |
| **Total** | | **12** | **0** | **15** | **385** | **390** | **775** | **20** |

| Semester 4th | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Subject Code** | **Subject Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BGWDS1-401** | Programming in Python | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-402** | Animation Art | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-403** | Computer Graphics | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-404** | Programming in Python Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BGWDS1-405** | Animation Art Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BGWDS1-406** | Computer Graphics Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BGWDS1-407** | Video Editing | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BGWDS1-408** | Video Editing Laboratory | 0 | 0 | 2 | 20 | 30 | 50 | 1 |
| **BGWDS1-409** | Mentoring and Professional Development | 0 | 0 | 1 | 25 | --** | 25 | 1 |
| **Total** | | | | | **385** | **390** | **775** | **20** |

## MATHEMATICS

**Subject Code: BGWDS1-101**          **L T PC**          **Durations: 45Hrs.**
                                       **3 0 0 3**

**Objectives and Expected Outcomes:** The objectives of this course are to Student must have the knowledge of Basic Mathematics. After studying this course, students will be able to: Represent data using various mathematical notions. Explain different terms used in basic mathematics. Describe various operations and formulas used to solve mathematical problems.

### UNIT-I (12 Hrs.)
**Set Introduction**: Objectives, Representation of Sets (Roster Method, Set Builder Method), Types of Sets (Null Set, Singleton Set, Finite Set, Infinite Set, Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, Difference of Set, Symmetric Difference of Set) Universal Sets, Complement of a Set.

### UNIT-II (11 Hrs.)
**Logic Statement**: Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent, Statements, Tautologies and Contradictions.

### UNIT-III (12 Hrs.)
**Matrices Introduction:** Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, Unit
Matrix, Null Matrix,Comparable Matrix, Equal Matrix), Scalar Multiplication, Negative of Matrix, Addition of Matrix, Difference of two Matrix, Multiplication of Matrices, Transpose of a Matrix.

### UNIT-IV (10 Hrs.)
**Progressions Introduction:** Arithmetic Progression, Sum of Finite number of quantities in A.P, Arithmetic
Means, Geometric Progression, Geometric Mean.

**Recommended Books:**
1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, McGraw Hill, 6th Edition, 2017.
2. College Mathematics, Schaum Series, Frank Ayers and Philip A. Schmidt published by Tata McGraw Hill,2010

## FUNDAMENTALS OF COMPUTER AND IT

**Subject Code: BGWDS1-102**          **L T P C**          **Durations: 45 Hrs.**
                                       **3 0 0 3**

**Objectives and Expected Outcomes:** To understanding the concept of input and output devices of Computers. Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices. Understand an operating

system and its working, and solve common problems related to operating systems. Learn basic word processing, Spreadsheet and Presentation Graphics Software skills. Study to use the Internet safely, legally, and responsibly.

### UNIT- I (12 Hrs.)

**Human Computer Interface**: Concepts of Hardware and Software; Data and Information. Functional Units of Computer System: CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors. Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.
**Data Representation:** Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.

### UNIT-II (11 Hrs.)

**Concept of Computing, Types of Languages:** Machine, assembly and High-level Language; Operating system as user interface, utility programs.
**Word processing:** Editing features, formatting features, saving, printing,
table handling, page settings, spell-checking, macros, mail-merge, equation editors.

### UNIT- III (10 Hrs.)

**Spreadsheet:** Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs.
**Presentation Graphics Software:** Templates, views, formatting slide, slides with graphs, animation, using
special features, presenting slide shows.

### UNIT –IV (12 Hrs.)

**Electronic Payment System:** Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority.
Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Embedded Systems and Internet of Things (IoT)

**Recommended Books:**

1. "Introduction to Computers", Peter Norton, McGraw Hill Education; 7 edition(1 July 2017).
2. Computers Today, D. H. Sanders, McGraw Hill. First Edition edition(1983)
3. "Computers", Larry long & Nancy long, Twelfth edition, Prentice Hall. (January 13,2004)
4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen FMonk, Thomson Learning , Cengage Learning; 15 edition (February 23,2017).

## INTRODUCTION TO SCRIPTING LANGUAGE

**Subject Code: BGWDS1-103**          **LT PC**                    **Durations: 45Hrs.**
                                       **3 0 0 3**

**Objectives and Expected Outcomes:** Student should be able to understand various tags under HTML. Students should be able to write HTML programs. To develop HTML pages and websites.

### UNIT-I (11 Hrs.)

**Introduction to HTML**: HTML and the World Wide Web, HTML elements, basic structure elements of HTML, creating HTML pages, HTML tags, colour and fonts, formatting the body section, creating links. Adding graphics with image elements, using image as links, image maps, image files. Adding sound and Video formats, other multimedia formats, adding multimedia to web pages.

### UNIT-II (11 Hrs.)

**Presenting information in tables**, Understanding the use of frames, frame set documents, targeted links, non frame elements, inline frames.
**Building interactivity with forms**, form elements and attributes, using form control elements, processing forms.

### UNIT-III (11 Hrs.)

**Style Sheets & Graphics in HTML**: Understanding styles, Style rules, Creating styles for tags, Creating classes & applying style. Formatting text & paragraphs in HTML: Introduction to Font family, Style sheets, Displaying graphics
**Page Layout & Navigation in HTML**: Navigational Aids, Layouts, Tables & Forms, Incorporating Sound & Video

### UNIT–IV (12 Hrs.)

**Introduction to Cascading Style Sheets:** Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties), Creating page Layout and Site Designs.

**Recommended Books:**
 1. HTML & CSS: The Complete Reference, Fifth Edition (English, Paperback, Powell Thomas), edition Tata McGraw-Hill,2003.
 2. Internet& Web Technologies by Raj Kamal, edition Tata McGraw-Hill Education.2009.
 3. Fundamentals of Internet and WWW, by Greenlaw R; Heppe, 2nd Edition, Tata

## WORKSHOP ON DESKTOP  PUBLISHING-LAB

**Subject Code: BGWDS1-104**          **LTPC**
                                       **00 4 2**

**Objectives and Expected Outcomes:** Students must have basic understanding of designing/ Painting tools. Softcopy & Hardcopy of the exercises are to be maintained during the practical labs and to be submitted during the End Semester Examinations. The students will gain professional skills of Desk Top Publishing Tools like designing, Printing & Publishing by using various tools. Develop skills in printing

jobs through basic understanding of a variety of designing tools. Apply these concepts and knowledge in designing field including practice from text formatting to final publishing. Workshops are included to enhance professional skills like Brochures, Flexes, Business Cards, Certificates and News Letter layouts etc.

**Experiments:**
- Design and print a Title Page of a Magazine/Book.
- Prepare multiple designs for a Flex by using different Tools.
- Prepare NSS Certificates for appreciation using logos of University, College & NSS unit.
- Prepare 5 different Designing of Business Cards.
- Prepare Envelops displaying full address of the company by inserting graphical symbol/ logos of company.
- Design and Print Invoices for three companies.
- Prepare and print News Letter Layoutsfor anyfive activities of your college/university.
- Prepare Invitation Cards for cultural meet held in your college.
- Design and print Brochures to advertise a "Blood Donation Camp" in your college.
- Design Logos of your college, University & Govt. of Punjab also display these logos on black background as water mark.
- Design, Print and Publish 5 motivations Playcards.
- Design & Print assignment book of minimum 20 Pages an any Topic.
- Design & Print any five most important activities of your college in a collage.
- Design & Print Question Paper of any Subject.
- Assemble all the latest news cutting of your activities on a 10 X 8 size flex.

**Recommended Books:**
1. DTP Course, First edition by ShirishChavan published by Rapidex,2003.
2. DTP Course Kit, First edition by Vikas Gupta published byComdex,2010.
3. CorelDraw 9, first edition by David Karlins published by Techmedia, Pearson Education(US),1999.
4. Adobe Illustrator CC, First edition by Brian Wood published by Adobe Press, 2019.

## INTRODUCTION TO SCRIPTING LANGUAGES LABORATORY

Subject Code: BGWDS1-105        L T P C
                                           0 0 4 2

**Objectives and Expected Outcomes:** Student should be able to understand various tags under HTML. Students should be able to write HTML programs. To develop HTML pages and websites.
**Experiments:**
- Acquaintance with elements, Tags and basic structure of HTML files.
- Practicing basic and advanced text formatting.
- Working with Background, Text and Font properties.
- Practicing use of multimedia components (Image, Video & Sound) in HTML document.
- Designing of webpage-Document Layout.
- Designing of webpage-Working with List.
- Designing of webpage-Working with Tables.

- Practicing Hyper linking of Webpages.
- Designing of webpage-Working with Frames.
- Designing of webpage-Working with Forms and Controls.
- Acquaintance with creating style sheet, CSS properties and styling.

## FUNDAMENTALS OF COMPUTER AND IT LABORATORY

**Subject Code: BGWDS1-106**

**LT PC**
**0 0 4 2**

**Objectives and Expected Outcomes:** Familiarizing with Open Office (Word processing, Spreadsheets and Presentation). To acquire knowledge on editor, spread sheet and presentation software. The students will be able to perform documentation and accounting operations. Students can learn how to perform presentation skills.

**Experiments:**

**Word Orientation:** The instructor needs to give an overview of word processor. Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

- Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.
- Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
- Creating a Newsletter Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs. Creating a Feedback form
- Features to be covered: - Forms, Text Fields, Inserting objects, Mail Merge in Word.

**Excel Orientation:**

The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files.

- Creating a Scheduler Features to be covered: - Gridlines, Format Cells, Summation, auto fill, Formatting Text.
- Calculations Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
- Performance Analysis Features to be covered: - Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.
- Game (like Cricket, badminton) Score Card Features to be covered: - Pivot Tables, Interactive Buttons, Importing Data, Data Protection, DataValidation.

**Presentation Orientation:**

- Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes: - PPT Orientation, Slide Layouts, Inserting Text, WordArt, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows.
- This session helps students in making their presentations interactive. Topics covered includes Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
- Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing.
- Power point test would be conducted. Students will be given model power point presentation which needs to be replicated.

**Internet and its Applications:** The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines.

- To learn to setup an e-mail account and send and receive e-mails.
- To learn to subscribe/post on a blog and to use torrents for accelerateddownloads.
- Hands on experience in online banking and making an online payment for anydomestic bill.

**Recommended Books:**
1. IT Tools, R.K. Jain, Khanna Publishing House.
2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, second edition,2012.
3. Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons, 3rd Edition (24 May2004).
4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen FMonk, Thomson Learning , Cengage Learning; 15 edition (February 23,2017).

## ENGLISH

| Subject Code: BGWDS1-107 | LT P C | Duration: 15 Hrs. |
|---|---|---|
|  | 1 0 0 1 |  |

**Objectives and Expected Outcomes**: The objective of this course is to introduce students to the theory, fundamentals and tools of communication. To help the students become the independent users of English language. To develop in them vital communication skills which are integral to their personal, social and professional interactions. The syllabus shall address the issues relating to the Language of communication. Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

### UNIT-I (4 Hrs.)

**Introduction:** Theory of Communication**,** Types and modes of Communication

### UNIT-II (5Hrs.)

**Language of Communication:** Verbal and Non-verbal, Spoken and Written, Personal, Social and Business, Barriers and Strategies, Intra-personal, Inter-personal and Group communication

## UNIT-III (3 Hrs.)

**Reading and Understanding:** Close Reading, Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation(from Hindi/Punjabi to English and vice-versa), Precise writing/Paraphrasing (for International Students), Literary/Knowledge Texts

## UNIT-IV (3 Hrs.)

**Writing Skills:** Documenting, Report Writing, Making notes, Letter writing

### Recommended Books:

1. Fluency in English - Part II, Oxford University Press,2006.
2. Business English, Pearson,2008.
3. Language, Literature and Creativity, Orient Blackswan,2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra,DrRanjanaKaul, Dr BratiBiswas
5. On Writing Well. William Zinsser. Harper Resource Book.2001
6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
7. Data Communication System, Black, Ulysse, Third Edition,PHI.
8. Data and Computer Communications, Stalling, Ninth Edition, PHI.

## ENGLISH PRACTICAL/LABORATORY

| Subject Code: BGWDS1-108 | LT PC |
|---|---|
| | 0 0 2 1 |

**Expected Outcomes**: The objective of this course is to introduce students to the theory, fundamentals, and tools of communication. To help the students become the independent users of English language. To develop in them vital communication skills which are integral to their personal, social, and professional interactions. The syllabus shall address the issues relating to the Language of communication. Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

**Interactive practice sessions in Language Lab on Oral Communication**

- Listening Comprehension
- Self Introduction, Group Discussion and RolePlay
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations
- Monologue
- Effective Communication/ Miss-Communication
- Public Speaking

**Recommended Books:**

1. Fluency in English - Part II, Oxford University Press,2006.
2. Business English, Pearson,2008.
3. Practical English Usage. Michael Swan. OUP.1995.
4. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press.2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress,1997.

## HUMAN VALUES, DE-ADDICTION AND TRAFFIC RULES

**Subject Code: BGWDS1-109**       **L T PC**             **Duration: 45Hrs.**

                        **3 0 0 3**

**Objectives and Expected Outcomes:** To help the students appreciate the essential complementarily between 'VALUES' and'SKILLS'toensuresustainedhappinessandprosperitywhicharethecore aspirations of all human beings. To facilitate the development of a Holistic perspective among students

towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

### UNIT- I (9 Hrs.)

**Course Introduction** - Need, Basic Guidelines, Content and Process for Value Education, Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels, Introduction to C++: Identifier, Keywords, Constants, And Operators: Arithmetic, relational, logical, And conditional and assignment. Size of operator, Operator precedence and associatively.

### UNIT- II (8 Hrs.)

**Understanding Harmony in the Human Being - Harmony in Myself:** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' –Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity indetail, Programs to ensure Sanyam and Swasthya, Practice Exercises and Case Studies will be taken up in Practice Sessions.

### UNIT- III (17 Hrs.)

**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:** Understanding harmony in the Family- the basic unit of human interaction, Understanding value sin

human relationship; meaning of, Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

## UNIT- IV (11 Hrs.)

**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence:** Understanding the harmony in the Nature, Interconnectedness, and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence(Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**Implications of the above Holistic Understanding of Harmony on Professional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers, At the level of society: as mutually enriching institutions and organizations.

### Recommended Books:

1. Ivan Illich, 1974, Energy &Equity, The Trinity Press, Worcester, and HarperCollins,USA.
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs,Britain.
3. A Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

## HUMAN VALUES, DE-ADDICTION AND TRAFFIC RULES(LAB/SEMINAR)

**Subject Code: BGWDS1-110**

**L T P C**
**0 0 0 1**

One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar at least once during the semester. It will be binding for all the students to attend the seminar.

# 2<sup>ND</sup>
# SEMESTER

## FUNDAMENTS OF STATISTICS

**Subject Code: BGWDS1-201**    **L T P C**    **Duration: 45Hrs.**
                               **3 0  0 3**

**Objectives and Expected Outcomes:** To apply principles of software development and evolution. To specify, abstract, verify, validate, plan, develop and manage large software and learn emerging trends in software engineering.

After completion of this course the students will be able to: Learn the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. Ability to communicate effectively with a range of audiences. Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

### UNIT-I (11 Hrs.)

**Introduction to Software:** Definition, Software characteristics, Software components, Software Applications.

**Introduction to Software Engineering:** Definition, Software Engineering Paradigms, Waterfall Model, Prototyping Model, Interactive Enhancement Model, the Spiral Model.

### UNIT- II (11Hrs.)

**Software Metrics:** Role of Metrics and Measurement, Metrics for software productivity and quality, Measurement software, size–oriented metrics, function oriented metrics, Metrics for software quality. **Software Requirement Specification (SRS):** Problem analysis, structuring information, Data flow diagram and data dictionary, structured analysis, Characteristics and component of (SRS).

### UNIT- III (13Hrs.)

**Planning a Software Project:** Cost estimation, uncertainties in cost estimation, Single variable model, COCOMO model, Project scheduling and milestones, Software & Personal Planning, Verification & Validation (V & V), inspection & review.

**System Design:** Design Objectives, Design Principles, problem, Partitioning, Abstraction, Top Down and Bottom–up techniques, Structure Design, Structure Charts, Design Methodology.

### UNIT- IV (10Hrs.)

**Coding:** Coding by Top–down and Bottom–up, Structured Programming, Information Hiding, Programming style, Internal Documentation.

**Testing:** Level of testing, Test cases and test criteria, Functional Testing, Structural Testing.

**Recommended Books:**
1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach ", Sixth Edition,McGraw Hill.
2. R.E. Fairley, "Software Engineering Concepts", Paperback Edition, McGrawHill.
3. Jalota, "An Integrated Approach to Software Engineering", Third Edition, NarosaPublishing House.

## CONCEPTS OF WEBSITE DESIGNING AND DEVELOPMENT

**Subject Code: BGWDS1-202**          **L T PC**                    **Duration: 45 Hrs.**
                                      **3 0 0 3**

**Objectives and Expected Outcomes:** Know about the basic functioning of WWW and websites. Learn various WWW concepts. Learn the concepts of web designing. Learn how to host websites

### UNIT-I (14 Hrs.)

**Introduction to WWW:** Protocols and programs, secure connections, application and development tools, the web browser. Web site design principles, planning the site and navigation, Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols. The World Wide Web-HTTP request message-response message-Web Clients, What is server, choices, setting up servers, Logging users, dynamic IP. Understanding hyperlinks, URLS, Domain names, Concepts of web hosting. Introduction to Web servers- Windows based/Linux based. Introduction to W3C Standards.

### UNIT- II (12 Hrs.)

**Types of Websites**: Static and Dynamic websites, Ideas about Open Source, Creative Commons, worldwide web-based philanthropic projects Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

### UNIT- III (11 Hrs.)

**Introduction to database-** MySQL, Introduction to server-side scripting language- PHP, Introduction to Client -side scripting- Javascript, Understanding how MySQL and PHP works together to create a dynamic website, Integrating XML,DHTML Understanding content management system (CMS):Introduction to open
source CMS- Joomla, Concepts of Categories and Articles, Concepts of Modules, components, and plug ins.

### UNIT- IV (12 Hrs.)

**Blog Interface**: What are blogs, The most popular blog engines- Word press and Blogger, Introduction to the blog interface dashboard, Categories, tags, permalinks and short links.
Search Engine Optimization: Introduction to SEO, Search Engines- how search engines work, Black Hat vs White Hat SEO, Best SEO practices, Keywords, How to write web content, Parameters/standard of good SEO

**Recommended Books:**

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya,Wiley-India
2. Steven Holzner,"HTML Black Book", Dremtechpress.
3. Web Technologies, Black Book, DreamtechPress

## OBJECT ORIENTED PROGRAMMING USING C++

**Subject Code:BGWDS1-203**          **L T PC**          **Duration: 45Hrs.**
                                      **3 0 0 3**

**Objectives and Expected Outcomes**: To learn programming from real world examples. To understand Object oriented approach for finding. To create computer based solutions to various real-world problems using C++. To learn various concepts of object oriented approach towards problem solving

### UNIT - I (12 Hrs.)

**Principles of object oriented programming:** Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure Oriented Language(C) and Object Oriented Language

### UNIT - II (11 Hrs.)

**Classes & Objects and Concept of Constructors:** Defining classes, Defining member functions, Declaration of objects to class, Access to member variables from objects, Different forms of member functions, Access specifiers (Private, public, protected), Array of objects. Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors.

### UNIT - III (12 Hrs.)

**Inheritance and Operator overloading:** Introduction to Inheritance, Types of inheritance: - Single inheritance, Multiple inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid inheritance, Defining operator overloading, Overloading of Unary and Binary operators, Rules for overloading operators

### UNIT - IV (12 Hrs.)

**Polymorphism and File Handling:** Early Binding, Late Binding, Virtual Functions, pure virtual functions, Abstract Classes.

**Recommended Books**

1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, TataMc-Graw Hill, 2009.
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition Galgotia Publications,2013.
3. The C++ Programming Language, BjarnaStroustrup, Third Edition, Addison- Wesley PublishingCompany,2015.
4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing,2017

## OBJECT ORIENTED PROGRAMMING USINGC++ LABORATORY

**Subject Code: BGWDS1-204**          **L T P C 0 0 4 2**

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-: 302 Data Structures. Students are required to develop programs in C/C++ language.

**Experiments:**
1. Write a program to enter mark of 6 different subjects and find out the total mark (Using cin and cout statement)
2. Write a function using reference variables as arguments to swap the values of pair of integers. Program to apply various operations onstack.
3. Write a function to find largest of three numbers.
4. Write a program to find a factorial of a number.
5. Define a class to represent a bank account which includes the following members as Data members: a) Name of the depositor b)Account Number c)Withdrawal amount d)Balance amount in the account
6. Write the above program for handling n number of account holders using array of objects.
7. Write a C++ program to compute area of right-angle triangle, equilateral triangle, isosceles triangle using function overloading concept.
8. Consider a publishing company that markets both book and audio cassette version to its works. Create a class Publication that stores the title (a string) and price (type float) of a publication. Derive the following two classes from the above Publication class: Book which adds a page count (int) and Tape which adds a playing time in minutes(float). Each class should have get_data() function to get its data from the user at the keyboard. Write the main () function to test the Book and Tape classes by creating instances of the masking the user to fill in data with get_data()andthen displaying it using put_data().
9. Write a program for overloading of Unary ++ operator.
10. Write a program for overloading of Binary + operator.

## SOFTWARE LAB (FUNDAMENTALS OF STATISTICS LABORATORY)

**Subject Code: BGWDS1-205**          **L T P C**
                                       **0 0 4 2**

**Objectives and Expected Outcomes**: Students must have the knowledge of Spreadsheet. The students will develop analytical behavior & will have better understanding of analyzing data and testing hypotheses.

**Experiments:**
- Represent data using various Frequency table and Graphs.
- Display the Maximum and Minimum market data.
- Display year wise strength of the students of a college in Tabular form &Graphical form.
- Calculate the average marks of the students of your College.
- Print measure of Central Tendency using grouped and ungrouped data.

- Calculate an appropriate measure of dispersion using grouped and ungrouped data.
- Make an array and calculate range of the data.
- Represent the placement record of the students of your college.

**Reference Book:**
1. Statistics for Economics, TR Jain, VKOhri.
2. Statistics and Data Analysis, A.Abebe, J. Daniels, J.W.Mckean, December 2000.


## WORKSHOP ON DIGITAL IMAGE EDITING

**Subject Code: BGWDS1-206**   **LTPC**   **Duration: 45Hrs**
**3 0 04**

**Objectives and Expected Outcomes**: The students will be able to learn photo editing. The students will understand the function of Photoshop. The students will understand various types of photo editing tasks


### UNIT- I (12 Hrs.)
**Introduction to Photoshop**:- Creating a New File, Main Selections, Picking color, Filling a selection with color, More ways to choose colors and fill selections, Painting with paintbrush tool, Using the magic wand tool and applying a filter, Saving your document Color Mode, Gray Scale Color Mode, RGB Color Mode, CMYK Color Mode, Bitmap Mode, Open a file, Preference.

### UNIT- II (12 Hrs.)
**Foreground & background, Changing:-**Foreground and Background colors, Using the Large color selection Boxes and small color swathes, Using the Eyedropper tool to sample Image color, Changing the Foreground Color While using a Painting Tool. Using Brushes, Selecting the Brush Shape, Drawing a vertical and Horizontal Straight lines with any brush, Drawing connecting Straight Lines ( at any angle) with any brush, Creating a New Brush, Saving Brushes, Loading Brushes, Creating a Custom Brushes, Using the Painting Modes, Fade, Airbrush Options, Pencil Options.

### UNIT- III (12 Hrs.)
**Tools**:-Rubber stamping an Aligned Clone, Rubber Stamping, Impressionist Style, Using line tool, Using the Editing Tool, The Smudge Tool, The Blur and Sharpen Tool, The Dodge / Burn Tool, Shadows, Mid,tones and Highlights, Selection Tools, Making Rectangular and Square Selections, Feathering a Selections, Lasso Features, Lasso Options, Making selections by color or Gray Scale value using the Magic Wand, Moving an anchor point or Direction point to change the shape of curve, Adding and Removing Anchor points, Moving Path, Saving, Loading and Creating New Path, Filling & StrokingPath.

### UNIT- IV (11 Hrs.)
**Introduction to layers:-** Creating & editing New layers, Adding a background, Creating Layer Mask, Layer Masks, Adjustment Layers, Adding Fills and Gradients, Filling with paintbuckettools,FillingtypewithgradingFills,ApplyingFilters,BlurFilters,RenderFilters,Sharpen, Filters, Sketch Filters, Texture Filters, Other Special Filters, Printing your document, Save your file, Save file as a JPEG, TIFF, GIF, PNG

**Recommended Books:**
1. Photoshop  CS6 Training Guide,English Paperback, By Satish Jain,BPB Publications),2015.
2. Adobe Photoshop Cs6 Bible,By Lisa Danae and Brad Dayley, Wiley India 2013 Edition.

## ENVIRONMENTAL STUDIES

**Subject Code: BGWDS1-207**     **LTPC**     **Duration: 45 Hrs**

**3 0 0 3**

**Objectives and Expected Outcomes**: Students will enable to understand environmental problems at local and national level through literature and general awareness. The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues. The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

### UNIT- I (12 Hrs.)

**Introduction to Environmental Studies:** Multidisciplinary nature of Environmental Studies: Scope &Importance Need for Public Awareness Ecosystems Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers) Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids Characteristic features, structure & functions of following Ecosystems: Forest Ecosystem

Aquatic Ecosystem (Ponds, Lakes, River &Ocean)

### UNIT- II (12 Hrs.)

**Environmental Pollution &Social Issues:** Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution Nuclear hazards and accidents & Health risks Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels Environmental disasters: Earthquakes, Floods, Cyclones, Landslides

### UNIT- III (12 Hrs.)

**Natural Resources: Renewable & Non-renewable resources:** Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act

Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting, Land Resources: Land as a resource; Land degradation, soil erosion and desertification Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy.

### UNIT- IV (11 Hrs.)

**Biodiversity & its conservation:** Types of Biodiversity: Species, Genetic & Ecosystem, India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions of India, Examples of Endangered & Endemic species of India, Red data book

### Recommended Books:

1. Bharucha, E. Text Book for Environmental Studies. University Grants Commission, NewDelhi.
2. Aggarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.

3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
   Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)

4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p

## DATA STRUCTURES

**Subject Code: BGWDS1-301**       **L T PC**       **Duration: 45 Hrs.**
**3 0 0 3**

**Objectives and Expected Outcomes**: Apply appropriate constructs of Programming language, coding standards for application development. Use appropriate data structures for problem solving and programming. Use algorithmic foundations for solving problems and programming. Apply appropriate searching and/or sorting techniques for application development. Develop programming logic and skills.

### UNIT-I (11 Hrs.)

**Introduction to Data Structures:** Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion.

**Arrays, Pointers and Strings:** Introduction to Arrays, Definition, One Dimensional Array and Multi Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings.

### UNIT-II (8 Hrs.)

**Stacks and Queue:** Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack, Queues, Introduction to Queue, Definition, Queue, Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.

### UNIT-III (14 Hrs.)

**Linked Lists and Trees:** Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List.

**Trees:-**Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.

### UNIT-IV (12 Hrs.)

**Graphs, Searching, Sorting and Hashing Graphs:** Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms.

**Searching and Sorting:** Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort.

**Hashing:** Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing

**Recommended Books:**

**1.** Brijesh Bakariya. Data Structures and Algorithms Implementation through C, BPB Publications.

2. Kruse R.L. Data Structures and Program Design in C;PHI

3. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", Addison Wesley

## ELEMENTS OF DESIGN

**Subject Code: BGWDS1-302**                    **LTPC**
                                                **0 0 4 2**

**Objectives and Expected Outcomes**: Learn methods & means to create images using the elements of design – space, depth, overlaps, transparency, plane, volume etc. Create any type of Graphic Design in the software. Gain the knowledge of formal systems of visual representation, using the basic principles and elements of design. Learn about the components of Design. Students will know the use of typography in Design.

### UNIT-I (12 Hrs.)
**Introduction:** Visual Perception and Design: Introduction of art and ideas - Visual & Critical thinking and analysis of 2Dimensional (2D) Art through history. Theoretical introduction to the perception, phenomenology, Definition of Design – Different applications of Design.
**Design Elements:** Elements of design: The concepts of design space and concepts of design. Visual elements - Line and shape, Form, value, texture, color - Measure, Type, Direction, Character visual elements.

### UNIT-II (10 Hrs.)
**Principles of Design:** Composition in contrast**:** black   and   white, positive     and    negatives, tessellation, units and their shapes, transformations, alteration. Unity and variety / element of interest, contrast, elaboration, Dominance, Expressive content. Color and Composition – Balance, Harmony and rhythm

### UNIT-III (12Hrs.)
**Composition:**Three Principles: Unity, Balance, Centre of interest, Achieving Emphasis: Light shade, Details, contrasts, Balance: Asymmetrical Balance, Informal Balance, RadialBalance.
**Text:**Type, text, and meaning. Typography as text and as image, Typography as text and as image combined with pictorialrepresentation.

### UNIT-IV (10 Hrs.)
**Color Wheel:** Mixing of Primary, Secondary and TertiaryColors. Tint, Shades, Hues,Tones. Warm Colors and CoolColors. Different    Color   schemes     (Complimentary, SplitComplimentary,Analogous, Triadicetc.

**Reference Book:**
1.  The Elements of Graphic Design, Alex W. White, Second Edition,AllworthPublications, 2011

## DATABASE MANAGEMENT SYSTEMS

**SubjectCode:**                    **L T PC**                    **Duration: 45 Hrs.**
                                    **3 0 0 3**
**Objectives and Expected Outcomes**: Understand the basic concepts of DBMS. Demonstrate an understanding of normalization theory and apply such knowledge to

the normalization of a database.

## UNIT–I (11 Hrs.)

**Introduction of DBMS**:- Data Modeling for a Database, Three level Architecture of DBMS, Components of a DBMS.

Introduction to Data Models, Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical and Relational Model, Entity Relationship Model.

## UNIT–II (12 Hrs.)

**Relational Database:-** Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.

## UNIT–III (12 Hrs.)

**IntroductiontoNormalization:-**,First,Second,Third NormalForms, DependencyPreservation,Boyce-CoddNormalForm,Multi-valuedDependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Domain-key normal form(DKNF).

## UNIT–IV (11 Hrs.)

**Database Recovery**:- Concurrency Management, Database Security, Integrity and Control. Structure of a Distributed Database, Design of Distributed Databases.

## Recommended Books

1. SQL, PL/SQL The Programming Language of Oracle", Ivan Bayross,BPB Publications, 4th Revised Edition(2009).
2. "An Introduction to Database Systems", C. J. Date, A. Kannan, S. Swamynathan, 8th Edition, Pearson Education,(2006).
3. Database Management Systems, Raghu Ramakrishnan, McGraw-Hill, Third Edition, 2014.hdeepBahga, Vijay Madisetti, 'Internet of Things (A Hands -on- Approach)', 1st Edn.,VPT.

## DATA STRUCTURES LABORATORY

| Subject Code: BGWDS1-304 | LT PC |
|---|---|
| | 0 0 4 2 |

**Expected Outcomes:-** Student must have the basic knowledge of C programming. Hardcopy of the exercises

are to be maintained during the practical labs and to be submitted during the End Semester Examinations. Apply

appropriate constructs of Programming language, coding standards for application development.

### Experiments:

1. Program to insert, delete and traverse an element from an array.
2. Program to merge two one dimensional array.
3. Program for addition, subtraction and multiplication of two matrix.
4. Program for implementing multiplication of two matrices.

5. Implement linear search using single and 2 dimensional array.
6. Program for implementing selection sort.
7. Program for implementing insertion sort.
8. Program for implementing quick sort.
9. Program to calculate length of the string using user defined function.

## ELEMENTS OF DESIGN LABORATORY

**Subject Code: BGWDS1-305**          **L T P C**
                                      **0 0 4 2**

**Expected Outcomes**:- Learn the skills about Visual Perceptions and Design. Know about design measurements and the concepts of design. Learn the concept of composition in contrast. Enhance designing skills like sketching, shapes and visual designs.

**Experiments:**
1. Assignment on magazine covers design by using typography.
2. Assignment on line and shape design,
3. Assignment on creating character visual elements design.
4. Assignment on Masking and Manipulation of pictures.
5. Assignment on to develop one creative by Radial Balance.
6. Assignment on creating design by mixing of Primary, Secondary and Tertiary Colors.
7. Assignment on text and as image combined with pictorial representation.
8. Assignment on creating Background design by using Warm Colors and Cool Colors.
9. Assignment on design & Print any five most important activities of your college in a collage
10. Assignment on designing & Printing any brochure.

## DATABASE MANAGEMENT SYSTEMS LABORATORY

**Subject Code: BGWDS1-306**          **L T P C**
                                      **0 0 4 2**

**Expected Outcomes** :-Able to understand various queries and their execution. Populate and query a database using SQL DML/DDL commands. Able to design new database and modify existing ones for new applications and reason about the efficiency of the result.

**Experiments:**
1. Used of CREATE, ALTER, RENAME and DROP statement in the database tables (relations)
2. Used of INSERT INTO, DELETE and UPDATE statement in the database tables
3. Use of simple select statement.
4. Use of select query on two relations.
5. Use of nesting of queries.
6. Use of aggregate functions.
7. Use of substring comparison.

8. Use of order by statement.
9. Consider the following schema for a LibraryDatabase:
   BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name) PUBLISHER (Name, Address, Phone) BOOK_COPIES (Book_id, Branch_id,No-of_Copies) BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH (Branch_id, Branch_Name, Address)
   Write SQL queries to: Retrieve details of all books in the library_ id, title, name of publisher, authors, number of copies in eachbranch,etc.
10. Write a PL/SQL code to add two numbers and display the result. Read the numbers during run time.

## IMAGE EDITING & PHOTOGRAPHY

**Subject Code: BGWDS1-307**  **L T P C**  **Duration: 45Hrs.**
**3 0 0 3**

**Objectives and Expected Outcomes**: Know about the basic functions and features of digital camera. Learn the various formats of camera and functioning of SLR camera and its controls such that they can handle it well and get correct exposure for their photographs.

### UNIT–I (14 Hrs.)

**Camera Controls:** Introductions of camera: its parts and types. Menu items and shooting modes (Auto vs. Scene vs. Priority).

**Exposure, Black and White Conversion, Intro to Lighting:** Black and White photographs angle and their conceptual editing - Black & White conversion practice Exposure compensation. Concept of high- and low key Studio session.

### UNIT–II (10 Hrs.)

**The Portrait:** Introduction of Portrait Image and its types. Discussion of portrait genres and lighting techniques (studio, natural) Review aperture, shutter speed, ISO. Practice editing and cropping.

**Composition tips, and Shooting:** Composition tips and photography shooting methods. Night/Day photography and low light shooting and there difference.

### UNIT–III (11 Hrs.)

**Conceptual Photography and Contemporary Art:** Photography Methods for conceptual click. Contemporary art shoot and editing techniques.

**Creating a Body of Work:** Sequence editing Trouble shooting with editing.

### UNIT–IV (10 Hrs.)

**Basics of Editing:** Introduction to Editing, fixing blemishes, color correcting and selective edits.

**Output:** Ready images for final output. Web vs. print. Color space conversion.

**Recommended Books:**

1. Tate - The Photography Ideas Book, Lorna Yabsley, 2019.**.**

**Subject Code: BGWDS1-308**  **L T P C**
**0 0 2 1**

**Objectives and Expected Outcomes**: Handle photography related to above mention subjects and shall be able to edit or fine tune their photographs using software. Learn about in depth knowledge of using

Photoshop's various tools and techniques. Learn about vector software illustrator and its different tools and techniques. Feel conversant with the terminology used while discussing exposures and lighting conditions.

**Experiments:**
1. Assignment on lighting techniques for product photography and portrait photography.
2. Assignment on photo shoots (Exposure, Role of different focal lengths, Visual Composition).
3. Assignment on clicking the photos from different genres.
4. Assignment on digital workflow (Editing the image in the software).
5. Assignment on working with strobe lights & on-camera Flash.
6. Assignment on detailed understanding of exposure metering.
7. Assignment on digital workflow (Digital black and white photography).
8. Assignment on High Dynamic Range (HDR Photography).
9. Assignment on studio photography techniques (post shoot processing of photographs).
10. Assignment on the submission of Theme/Project based campaign.

## PROGRAMMING IN PYTHON

**Subject Code: BGWDS1-401**  **LT PC**  **Durations: 45 Hrs.**
**3 0 0 3**

**Objectives and Expected Outcomes:** Familiar with Python environment, data types, operators used in Python. Compare and contrast Python with other programming languages. Learn the use of control structures and numerous native data types with their methods. Design user defined functions, modules, and packages. Create and handle files in Python.

### UNIT-I (12 Hrs.)

**Introduction to Python Programming Language:** Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature, Python differences from other languages.

**Python Data Types & Input/ Output:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command.

**Operators and Expressions:** Operators in Python, Expressions, Precedence, Associatively of Operators, Non Associative Operators.

### UNIT-II (12 Hrs.)

**Control Structures:** Decision making statements, Python loops, Python control statements.

**Python Native Data Types:** Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

### UNIT-III (11 Hrs.)

**Python Functions:** Functions, Advantages of Functions, Built-in Functions, and User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.

**Python Modules:** Module definition, Need of modules, Creating a module, Importing module, Path

Searching of a Module, Module Reloading, Standard Modules, Python Packages.

## UNIT-IV (10 Hrs.)

**Exception Handling:** Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python.

**File Management in Python:** Operations on files (opening, modes, attributes, encoding, closing), read () & write () methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python.

**Classes and Objects:** The concept of OOPS in Python, Designing classes, Creating objects, Accessing attributes, Editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.

**Recommended Books:**

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.
2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

## ANIMATION ART

| Subject Code: BGWDS1-402 | LTPC | Durations: 45 Hrs. |
|---|---|---|
| | 3 0 0 3 | |

**Objectives and Expected Outcomes:** Learn the different mediums of Drawing and its importance for animation. Know about the different medium and techniques of drawing pencils and painting brushes. Draw landscape with proper sketching sense, draw trees, plants, buildings, sky and to create the animation backgrounds. Learn about the light and shadow and surface and texture sketching.

## UNIT- I (12 Hrs.)

**Starting with the tools for drawing:**

**Types of pencils:-**(HB, B, 2B,4B, 6B,8B, 10B, 12B), Charcoal Pencil, Clutch Pencil.

**Sheets:**-Cartridge, Hand Made, Ivory, Art Card, duplex, News Print, Mount board sheet etc.

**Colors:**-Poster color, Water Color, Pastel color, Pencil Color, waterproof ink.

**Brushes:**-Round and Flat

**Object Drawing:** Principles of object drawing, Draw common shapes, forms on a Two- Dimension (2D) surface with geometry - structure, surface and texture, perspective and points of view, Knowing about line and make effects that can build, definition of light and shadow on objects and an assignment.

## UNIT-II (11 Hrs.)

**Rendition** of the effect of light on simple forms and objects mood changing, quality of surface, solidity, drama, and impact.

**Viewpoint Drawing:** Viewpoint Drawing. Theory of viewpoint, one point and two point perspective as applied to objects, furniture, interior and exteriors of the buildings, study of light and shade etc.

## UNIT- III (12 Hrs.)

**Study of Living World :**Drawing from Nature, Location drawing and learning to represent trees, plants, bushes, shrubs, insects, birds, and animals with attention to structure and morphology, proportion, volume, and behavior

## UNIT –IV (11 Hrs.)

**Human Creativity:** Explanation to human figure drawing –Drawings from Mannequin, Sketching of

person figure from outside as well as inside. To know and catch the signs of the human form, weight, balance, Rhythm and proportion.

**Making Storyboard:** What is storyboard, usage of story board, drawing on storyboard, understand and draw movements of camera in story board.

**Recommended Books:**
1. Drawing for the Absolute and Utter Beginner, Watson- Guptill, 2018.
2. The Complete Book of Drawing Techniques: A Complete Guide for the Artist, Peter Stanyer, ArcturusPublishing,2004.

## COMPUTER GRAPHICS

| Subject Code: BGWDS1-403 | LT PC | Durations: 45 Hrs. |
|---|---|---|
| | 3 0 0 3 | |

**Objectives and Expected Outcomes:** Let students understand basics of Computer Graphics, Input/output primitive and basic transformations, which can be applied on objects of graphics. To develop the logical and reasoning skills of the students. Learn graphical primitives and their algorithms.

### UNIT-I (12 Hrs.)
**Introduction to Computer Graphics:-**Applications of Computer Graphics. Graphs and Types of Graphs
**Input Devices:** Light Pens, Graphic Tablets, Joysticks, Track Ball, Data Glove, Digitizers, Image Scanner.
**Video Display Devices:** Refresh Cathode Ray Tube, Raster Scan displays, Random Scan displays, Color CRT - monitors and Color generating techniques (Shadow Mask, Beam Penetration), Flat-Panel Displays; 3-D Viewing Devices, Graphics monitors and workstations, Color Models (RGB and CMY), Lookup Table.
**Introduction Virtual Reality & Environments:** Applications in Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.
### UNIT-II (11 Hrs.)
**Scan-conversions:-** Process and need of Scan Conversion, Scan conversion algorithms for Line, Circle and Ellipse using direct method, Bresenham's algorithms for line & circle and Midpoint Ellipse Algorithm along with their derivations, Area Filling Techniques, Flood Fill Techniques, Character Generation

### UNIT-III (12 Hrs.)
**2–DimensionalGraphics:-**Cartesian and need of Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection, Shearing), Viewing transformation and clipping (line, polygon and text) using Cohen- Sutherland, Sutherland Hodgeman and Liang Barsky algorithm for clipping.
### UNIT–IV (10 Hrs.)
**3–DimensionalGraphics:-** Introduction to 3-dimensional Graphics: Geometric Transformations (Translation, Scaling, Rotation), Mathematics of Projections (Parallel & Perspective). Color Shading. Introduction to Morphing techniques.

**Recommended Books:**

1. D. Hearn and M.P. Baker, Computer Graphics, PHI New Delhi.

2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes,.R.L Phillips, Computer Graphics Principles & Practices, Second Edition, Pearson Education,2007.

3. R.A. Plastock and G. Kalley, Computer Graphic, McGraw Hill,1986.

## PROGRAMMING IN PYTHON LABORATORY
## IMAGE EDITING & PHOTOGRAPHY LABORATORY

**Subject Code: BGWDS1-404**          **L T P C**
                                                   **0  0  4 2**

**Expected Outcomes:-** Solve simple to advanced problems using Python language. Develop logic of various programming problems using numerous data types and Control structures of Python. Implement different data structures using Python. Implement modules and functions using Python. Design and implement the concept of object oriented programming structures. Implement file handling.

**Experiments:-**
1. Compute sum, subtraction, multiplication, division and exponent of given variables input by the user.
2. Compute area of following shapes: circle, rectangle, triangle, square, trapezoid and Parallelogram.
3. Compute volume of following 3D shapes: cube, cylinder, cone and sphere.
4. Compute and print roots of quadratic equation $ax^2+bx+c=0$, where the values of a, b, and c are input by the user.
5. Print numbers up to N which are not divisible by 3, 6, 9,, e.g., 1, 2, 4, 5, 7,….
6. Write a program to determine whether a triangle is isosceles or not?
7. Print multiplication table of a number input by the user.
8. Compute sum of natural numbers from one to n number.
9. Print Fibonacci series up to n numbers e.g. 0 1 1 2 3 5 8 13…..n
10. Compute factorial of a given number.

## ANIMATION ART LABORATORY

**Subject Code: BGWDS1-405**          **LT P C**
                                                   **0 0 4 2**

**Expected Outcomes:-** Create basic shapes and forms on a two-dimensional surface using geometry. Learn observation, visualization and visually experiencing the content. Study about human figure for character drawing.

**Experiments:-**
1. Assignment on sketching by using Drawing pencils**:-**(HB, B, 2B,4B, 6B,8B, 10B, 12B), Charcoal Pencil, Clutch Pencil.
2. Assignment on drawing scenery by using colors (poster color, Water Color, Pastel color, Pencil Color, waterproof ink).
3. Assignment on poster designs with shades by using sheets (Cartridge, Hand Made, Ivory, Art Card, duplex, News Print, Mount board sheet etc.).
4. Assignment on Round and Flat brush painting.

5. Assignment on design based on geometry - structure, surface and texture.
6. Assignment on light and shadow on objects and an assignment.
7. Assignment on design based on objects mood changing, quality of surface, solidity, drama, and impact.
8. Assignment on one point and two point perspective.
9. Assignment on furniture, interior and exteriors of the buildings Designs.
10. Assignment on drawing Nature & Location scene.

## COMPUTER GRAPHICS LABORATORY

**Subject Code: BGWDS1-406**

**L T P C**
**0 0 4 2**

**Expected Outcomes:-** To equip students with techniques for developing structured computer Program. Learn the basic knowledge of computer graphics. Develop the logical and reasoning skills. Learn about the Practical applications of graphics, Program development and basic Animations without using graphical software.

**Experiments:-**
1. Use of basic functions of graphic available like circle, put pixel, rectangle, arc, ellipse, flood fill, set color etc.
2. Design a logo/poster using primitive functions.
3. Draw a 3 D object using palettes.
4. Line Drawing Algorithm : Direct method and DDA
5. Bresenham's Line Drawing Algorithm
6. Circle Generating Algorithm : Equation and trigonometric function.
7. Bresenham's Circle Generating Algorithm
8. Draw an ellipse using Midpoint Algorithm.
9. Translation transformation on a polygon.
10. Scaling transformation on a polygon

## VIDEO EDITING

**Subject Code: BGWDS1-407**

**LT PC**
**3 0 0 3**

**Durations: 45 Hrs.**

**Expected Outcomes:-** Create different moods using various sounds, which will further help them integrate the same into their film projects. Know about editing basics, tools and broadcast system. Knowledge of working with footages in an editing software.

### UNIT-I (14 Hrs.)

**Sound:-** Introduction to Audio, interrelationship between sound, culture and media theory. Ear Training, Critical listening, Role of sound in film, Storytelling through sound, Sound editing, working with Dialogue.

### UNIT-II (11 Hrs.)

**Mixing**-The mixing process, Monitoring basics of mixing, Basic Mixing Rules and techniques, Equalizing, Audio equipment, Studio Production Techniques, Effects introduction, overview,

compression.

## UNIT-III (10 Hrs.)

**Audio Formats -** Digital and Analogue practical assignments and practice,
**Mastering -**Introduction to mastering - Mastering setups – Monitoring (The whole practice will be done practically).

## UNIT–IV (10 Hrs.)

**Voiceover:**-The art of voiceover, how to lend voice to a short film, Voice modulation, voice sync.
**Submission:-** Design a sound track for a short film.

### Recommended Books:

1. Editing Digital Video (Digital Video and Audio Series, Robert Goodman & Patrick McGrath, McGraw -Hill Education, 2002.
2. The Technique of Film and Video Editing: History, Theory, and Practice, 6$^{th}$ Edition, Ken Dancyger, Routledge Publishers,2018.
4. Adobe Premiere Pro Bible, 1$^{st}$ edition, Adele Droblas, John Wiley & Sons, 2003.

## VIDEO EDITING LABORATORY

**Subject Code: BGWDS1-408**

**LT P C**
**0 0 2 1**

**Expected Outcomes:** Render out final films using appropriate compressors and formats. Know about the video editing in frames with time setting. Know about working, editing and synchronization of sound with footages. Students will know about the time durations of the video and rendering.

### Experiments:-

1. Assignment on creating one short video footage by using basic functions of the software
2. Assignment on designing a background, text and colors editing in video
3. Assignment on editing a video by using a time in frames
4. Assignment based on the mixing of 2 or more videos.
5. Assignment based on Audio equipment, Studio Production Techniques
6. Assignment based on effects introduction, overview, compression
7. Assignment based on **Audio Formats-** Digital and Analogue practical assignments and practice
8. Assignment based on mastering setups – Monitoring the sound, background
9. Assignment based on video editing by adding Voiceover
10. Assignment based on voice modulation, voice synchronization

## GUIDELINES REGARDING MENTORING AND PROFESSIONAL DEVELOPMENT

The objective of mentoring will be development of:
- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities.
For achieving the above, suggestive list of activities to be conducted are:

### Part – A (Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz(General/Technical)
5. Presentations by the students
6. Team building Exercises

### Part – B (Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B
Mentors/Faculty in charges shall maintain proper record student wise of each activity
conducted and the same shall be submitted to the department.