

# DEPARTMENT OF FOREIGN LANGUAGES

## KURUKSHETRA UNIVERSITY, KUSUKSHETRA

(Established by State Legislature Act XII of 1956)

(A + Grade, NAAC Accredited)

Syllabi and Scheme of Examination under Credit Based System of

### Certificate Course in Japanese Language (Semesters I & II)

To be implemented from the Session 2021-2022

Structure, Scheme of Examination, Credits and Teaching Hours of

Certificate in Japanese Language (Semesters I & II)

#### Semester-I

Paper No.	Name of the course	No. of Credits	Teaching hours per week	Examination scheme (Marks)			
				Theory	Internal assessment	Total marks	Duration of the exam
FLCJ-101	Japanese Scripts, vocabulary and Grammar-I	3	3	80	20	100	3 Hours
FLCJ-102	Translation and Essay-I	3	3	80	20	100	3 Hours
<b>Total Credits, Hours per week and marks in Sem. I</b>		<b>06</b>	<b>06</b>	<b>160</b>	<b>40</b>	<b>200</b>	<b>--</b>

#### Semester-II

Paper No.	Name of the course	No. of Credits	Teaching hours per week	Examination scheme (Marks)			
				Theory	Internal assessment	Total marks	Duration of the exam
FLCJ-201	Japanese Scripts, vocabulary and Grammar-II	3	3	80	20	100	3 Hours
FLCJ-202	Translation and Essay-II	3	3	80	20	100	3 Hours
<b>Total Credits, Hours per week and marks in Sem. II</b>		<b>06</b>	<b>06</b>	<b>160</b>	<b>40</b>	<b>200</b>	<b>--</b>

#### Total Credits, Hours per week and Marks in Sem. I & II

Total Credits, Hours per week & Marks in Semester I & II	No. of Credits	Teaching hours per week	Theory	Internal assessment	Total marks
	<b>12</b>	<b>12</b>	<b>320</b>	<b>80</b>	<b>400</b>

**Certificate Course in Japanese Language**  
**Semester-I**  
**Japanese Scripts, Vocabulary and Grammar-I**  
**CODE: FLCJ-101**

**Credits: 3**

**Theory: 80**  
**Internal Assessment: 20**  
**Max. Marks: 100**  
**Time: 3 Hours**

- (i) Study of scripts: Hiragana, Katakana and Kanji.
- (ii) Vocabulary and Grammar

**Prescribed Book –**

Minna no Nihongo(1-1), Goyal Publishers—Chapters 01 to 12

**Semester End Examination:**

- |      |                        |                 |
|------|------------------------|-----------------|
| (i)  | Scripts                | <b>20 marks</b> |
| (ii) | Vocabulary and Grammar | <b>60 marks</b> |

**Total Marks: 80**

**Internal Assessment:** Internal assessment will be based on the following criteria:

1. One class test will be held after two months of course. **5 marks**
2. Viva-voce examination (7.5+7.5 marks) will be held twice in a semester. First one will be conducted before the class test and the second one will be conducted before the End semester end examination. **15 marks**

**Total: 20 Marks**

# **Certificate Course in Japanese Language**

Semester-I

Translation and Essay-I

CODE: FLCJ-102

**Credits: 3**

**Theory: 80**

**Internal Assessment: 20**

**Max. Marks: 100**

**Time: 3 Hours**

- (i) Translation (English to Japanese and vice versa)
- (ii) Essay writing

## **Prescribed Book**

Minna no Nihongo(1-1), Goyal Publishers—Chapters 01 to 12

## **Semester End Examination:**

- (i) Translations (English to Japanese 30 marks, 60 Marks  
Japanese to English 30 marks)
- (ii) Essay writing on pre-assigned topics 20 Marks

**Total Marks: 80**

**Internal Assessment:** Internal assessment will be based on the following criteria:

1. One class test will be held after two months of course. **10 marks**
2. Two assignments (5+5 marks) will be taken twice in a semester. First one will be submitted before the class test and the second one will be submitted before the End semester end examination. **10 marks**

**Total: 20 Marks**

**Certificate Course in Japanese Language**  
**Semester-II**  
**Japanese Scripts, vocabulary and Grammar-II**  
**CODE: FLCJ-201**

**Credits: 3**

**Theory: 80**  
**Internal Assessment: 20**  
**Max. Marks: 100**  
**Time: 3 Hours**

- (i) Study of scripts: Hiragana, Katakana and Kanji.
- (ii) Vocabulary and Grammar

**Prescribed Book –**

Minna no Nihongo(1-2), Goyal Publishers—Chapters 13 to 25

**Semester End Examination:**

- |                             |          |
|-----------------------------|----------|
| (i) Scripts                 | 20 marks |
| (ii) Vocabulary and Grammar | 60 marks |

**Total Marks: 80**

**Internal Assessment:** Internal assessment will be based on the following criteria:

1. One class test will be held after two months of course. **5 marks**
2. Viva-voce examination (7.5+7.5 marks) will be held twice in a semester. First one will be conducted before the class test and the second one will be conducted before the End semester end examination. **15 marks**

**Total: 20 Marks**

# **Certificate Course in Japanese Language**

Semester-II

Translation and Essay-II

CODE: FLCJ-202

**Credits: 3**

**Theory: 80**

**Internal Assessment: 20**

**Max. Marks: 100**

**Time: 3 Hours**

- (i) Translation (English to Japanese and vice versa)
- (ii) Essay writing

## **Prescribed Book**

Minna no Nihongo(1-2), Goyal Publishers—Chapters 13 to 25

## **Semester End Examination:**

- (i) Translations (English to Japanese 30 marks, 60 Marks  
Japanese to English 30 marks)
- (ii) Essay writing on pre-assigned topics 20 Marks

**Total Marks: 80**

**Internal Assessment:** Internal assessment will be based on the following criteria:

1. One class test will be held after two months of course. **10 marks**
2. Two assignments (5+5 marks) will be taken twice in a semester. First one will be submitted before the class test and the second one will be submitted before the End semester end examination. **10 marks**

**Total: 20 Marks**

Department of Philosophy  
Kurukshetra University Kurukshetra  
Scheme of Examination and Syllabus of Certificate Course in Bhagavadgita  
Under Credit Based System  
w.e.f. 2021-22

Sem.	Paper	Nomenclature of paper	Contact hours	Credits (Theory +Practical )	Internal marks	External Marks	Total	Duration of Exam
I	101	<b>Fundamental Concepts of Bhagavad-Gita-I</b>	4	4	20	80	100	3Hrs
I	102*	<b>Bhagavad-Gita &amp; Art of Meditation-I</b>	4	4	---	---	100	As per schedule decided by the Department
II	201	<b>Fundamental Concepts of Bhagavad-Gita-II</b>	4	4	20	80	100	3Hrs
II	202*	<b>Bhagavad-Gita &amp; Art of Meditation-II</b>	4	4	---	--	100	As per schedule decided by the Department

**Note- \*Paper No. 102 and 202 each contain Practical-50 Marks +Viva-voce  
50Marks=100Marks**

**DEPARTMENT OF PHILOSOPHY  
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

**Paper No.101: Fundamental Concepts of Bhagavad-Gita-I**

**Maximum Marks =100**

Theory-80

Internal Assessment -20

**Time: 3 Hours**

**Credit:-4**

**Instructions:** The paper-setter is requested to set **Nine** questions in all i.e., One Compulsory objective type question (8x2) without any choice, equitably distributed over the whole syllabi and Two Questions from Each Unit equitably spread over the concerned unit. Examinees will have to attempt **Five** questions in all, selecting one question from each unit and **One Objective Type Question**. All questions carry equal marks.

**Course Outcome:** CO-101.1 After studying the First Unit, the student will be able to understand the history, background of Gita . CO-101.2 The Second Unit will make students to understand the self and Sthitprajna as an ideal person. CO-101.3 After studying the Third Unit, the students will be able to answer questions regarding Arjun Vishad. CO-101.4 The study of the Fourth Unit will help the students to understand the philosophy of Karma, Akarma and Vikrama.

**Unit-I** History and Background of Srimad-Bhagavadgita; The Gita and its Commentaries; Different Ways to attain Liberation: *Karmayoga, Jnana Yoga, Bhaktiyoga*.

**Unit-II** Understanding the Self and the Supreme; Characteristics of Individual Soul (*Jiva*). *Sthitaprajna* as an Ideal Person of the Gita; Concept of *Dharmakshetra Kurukshetra*.

**Unit-III** Meaning of *Arjun Vishad Yoga*; *Karma* and Kinds of *Karma*; *Karmayoga* and its Importance; Contemporary Relevance of *Karma Yoga*; *Sakama Karma* and *Nishkama Karma Yoga*.

**Unit- IV** *Karmyogi* as an Ideal Person of Gita; Divine and Demonic Qualities (*Aasuri-sampad and daivi-sampad*); Concept of *Karma, Akarma and Vikrama*; Concept of *Swadharma*

**Suggested Books:-**

1. *Srimad-Bhagavadgita*: Original Text.
2. *Srimadbhagavatam* 10 Vols. A.C. Prabhupada, BBT, Bombay, New York.
3. *Bhagavadgita as it is – His Divine Grace*: A.C. Bhaktivedanta Swami Prabhupada, Bhaktivedanta Book, Mumbai, 2009.
4. *Srimadbhagavadgita Sankara Bhasya* (Hindi), Gita Press, Gorakhpur.
5. *Srimadbhagavadgita Rahasya*: B.G. Tilak, Tilak Brothers Publication, Poona.
6. *Essays in the Gita*: Sri Aurobindo, Sri Aurobindo Ashram, Pondichery.
7. *The Gita in the Light of Modern Science*: R.B.Lal, Somaiya Publication, Bombay.
8. *Gita Darshan*; OSHO ( Vol. 1-8) Osho international foundation, Puna.
9. *Mai Shri Krishan Bol Raha Hu*. Acharya Shilak Ram. Vedic Yogashala,

**DEPARTMENT OF PHILOSOPHY  
KURUKSHETRA UNIVERSITY KURUKSHETRA**

**Paper – 102: Bhagavad-Gita & Art of Meditation-I**

Part - A: Practical - 50 Marks

Part - B: Viva-Voce - 50 Marks

Total - 100 Marks

Credit:-4

**Instructions:** There will be no written test in the Paper No.II. This paper is divided in Two Parts i.e. Part-A & Part-B. Part- A: Practical - 50 Marks & Part – B: Viva-Voce- 50 Marks

**Course Outcome:** CO-101.1 After studying the First Unit, the student will be able to understand about the Meditation . CO-101.2 The Second Unit will make students to know the way to gain knowledge. CO-101.3 After studying the Third Unit, the students will able to understand the different method of Yoga. CO-101.4 The study of the Fourth Unit will help the students to understand the concentration method.

**Unit-I** Meaning, Definition of the Concept of Meditation; Meditation and its Necessity in the Age of Globalization; Art of Meditation; Meditation and its kinds.

**Unit-II** Way to gain Knowledge; Role and Relevance of Sankirtana in Human Life; Ekagrtā and Meditation; Dharna and Meditation.

**Unit-III** Different Methods of Yoga: (i).Through control on mental modifications; (ii).Through awareness of mental modifications; (iii). Through perfection in actions; (iv). Through equanimity of mind; (v); Through meditating on God and depending on God only;

**Unit -IV** Concentration Method; Concept of *yoga karmasu kaushalam*; Concept of *samtvam yoga uchayate*; Concept of *trividh tapa*.

**Suggested Books:-**

- I. *Srimad-Bhagavadgita*: Original Text.
- II. *Srimadbhagavatam* 10 Vols. A.C. Prabhupada, BBT, Bombay, NewYork.
- III. *Bhagavadgita as it is – His Divine Grace*: A.C. Bhaktivedanta Swami Prabhupada, Bhaktivedanta Book, Mumbai, 2009.
- IV. *Srimadbhagavadgita Sankara Bhasya* (Hindi), Gita Press, Gorakhpur.
- V. *Srimadbhagavadgita Rahasaya*: B.G. Tilak, Tilak Brothers Publication, Poona.
- VI. *Essays in the Gita: Sri Aurobindo*, Sri Aurobindo Ashram, Pandichery.
- VII. *Kant and Gita*: K.M.P. Verma, Classical Publication, New Delhi.
- VIII. *Bhagavadgita for Executives*: V. Ramanathan, Bhartiya Vidya Bhavan, Bombay.



**DEPARTMENT OF PHILOSOPHY  
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

**Paper No.201: Fundamental Concepts of Bhagavad-Gita-II**

**Maximum Marks :100  
Theory:80  
Internal Assessment:20  
Time: 3 Hours  
Credit-4**

**Instructions:** The paper-setter is requested to set **Nine** questions in all i.e., One Compulsory objective type question (8x2) without any choice, equitably distributed over the whole syllabi and Two Questions from Each Unit equitably spread over the concerned unit. Examinees will have to attempt **Five** questions in all, selecting one question from each unit and **One Objective Type Question**. All questions carry equal marks.

**Course Outcome:** CO-201.1 After studying the First Unit, the student will be able to understand the Nature of Purush and Prakriti. CO-201.2 The Second Unit will make students to understand different Vichar of Gita. CO-201.3 After studying the Third Unit, the students will be able to answers questions regarding Bhakti Yoga. CO-201.4 The study of the Fourth Unit will help the students to understand the different concept of Gita.

**Unit – I.** Nature of Purush(Self); Prakriti and its three modes; Time (Kala) and its Influence; Dhyana Yoga;. Science and ne-Science ( Vidya and Avidya ).

**Unit-II** Concept of Yajyarth Vichar; Kshetraajaya-Vichar; Nirguna-Saguna Vichar; Concept of Trigunatit; Concept of Sthitaprajya.

**Unit-III** Bhakti Yoga and its practices; Six qualities of God & realization of the Supreme Person (God); Relevance of Bhakti in modern times; Enlightenment (Liberation) as the Ultimate goal of Man's Life.

**Unit-IV** Concept of *Om tat sat*; Concept of *Divya Chakshu*; Concept of *mamaivansh*; *Yogabhrasht gati*; Concept of *Swadharma nidhnam shreya*.

**Suggested Books:-**

1. *Srimad-Bhagavadgita*: Original Text.
- 2.. *Srimadbhagavatam* 10 Vols.: A.C. Prabhupada, BBT, Bombay, NewYork.
3. *Bhagavadgita as it is – His Divine Grace*: A.C. Bhaktivedanta Swami Prabhupada, Bhaktivedanta Book, Mumbai, 2009.
4. *Srimadbhagavadgita Sankara Bhasya* (Hindi), Gita Press, Gorakhpur.
5. *Srimadbhagavadgita Rahasaya*: B.G. Tilak, Tilak Brothers Publication, Poona.
6. *Essays in the Gita*: Sri Aurobindo, Sri Aurobindo Ashram, Pandichery.
7. *The Gita in the Light of Modern Science*: R.B.Lal, Somaiya Publication, Bombay
8. *Gita Darshan*; OSHO ( Vol. 1-8) Osho international foundation, Puna.
9. *Mai Shri Krishan Bol Raha Hu*. Acharya Shilak Ram. Vedic Yogashala, Kurukshetra

**DEPARTMENT OF PHILOSOPHY  
KURUKSHETRA UNIVERSITY KURUKSHETRA  
Certificate Course in Bhagavad-Gita**

**Paper – 202: Bhagavad-Gita & Art of Meditation-II**

Part - A: Practical - 50 Marks  
Part - B: Viva-Voce - 50 Marks  
Total - 100 Marks  
Credit-4

**Instructions:** There will be no written test in the Paper No. II. This paper is divided in Two Parts i.e. Part-A & Part-B. Part – A: Practical - 50 Marks & Part B: VivaVoce- 50 Marks.

**Course Outcome:** CO-101.1 After studying the First Unit, the student will be able to understand the importance of Karma. CO-101.2 The Second Unit will make students to understand the about the duty. CO-101.3 After studying the Third Unit, the students will able to understand the benefits of Meditation. CO-101.4 The study of the Fourth Unit will help the students to understand about different psychic problems.

**Unit-I** Importance of Karma in life. Relevance of Inner Change; Importance of social service; Importance of doing one's actions according to one's capabilities; My station and its duties.

**Unit-II** Duty for the sake of World solidarity and its importance in Contemporary Times. Trividh Aahar- Vihar; *Yuktahar viharshas*; Concept of Trividha Shrdha; Concept of Trividh -Yajya

**Unit-III** Benefits of Meditation ( Samadhi / Yoga ): Benefits of Meditation in Mental Disorder, Memory-Loss, Psycho-Somatic Diseases, Mental-Stress

**Unit-IV** Anger and other Psychic Problems Suicide, Terrorism, Blind Faith, Rajrishi; Politician and Meditation

**Suggested Books:-**

- I. *Srimad-Bhagavadgita*: Original Text.
- II. *Srimadbhagavatam* 10 Vols.: A.C. Prabhupada, BBT, Bombay, New York.
- III. *Bhagavadgita as it is – His Divine Grace*: A.C. Bhaktivedanta Swami Prabhupada, Bhaktivedanta Book, Mumbai, 2009.
- IV. *Srimadbhagavadgita Sankara Bhasya* (Hindi), Gita Press, Gorakhpur.
- V. *Srimadbhagavadgita Rahasaya*: B.G. Tilak, Tilak Brothers Publication, Poona.
- VI. *Essays in the Gita*: Sri Aurobindo, Sri Aurobindo Ashram, Pandichery.
- VII. *Kant and Gita*: K.M.P. Verma, Classical Publication, New Delhi.
- VIII. *Bhagavadgita for Executives*: V. Ramanathan, Bhartiya Vidya Bhavan, Bombay.

**Table 2: CO-PO matrix for the course B.COM 301 (CORPORATE ACCOUNTING-I)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 301.1	2	1	2	3	3	2	3	2
B.COM 301.2	2	3	2	3	3	3	3	2
B.COM 301.3	2	2	3	3	3	3	3	2
B.COM 301.4	3	1	3	3	3	3	3	2
Average	2.25	1.75	2.5	3	3	2.75	3	2

**Table 3: CO-PSO matrix for the course B.COM 301(CORPORATE ACCOUNTING-I)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 301.1	3	3	3	3
B.COM. 301.2	3	3	3	3
B.COM. 301.3	3	3	3	3
B.COM. 301.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 302 (INCOME TAX LAW & PRACTICE-I)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 302.1	2	3	3	3	3	2	2	2
B.COM 302.2	3	3	3	3	3	2	2	2
B.COM 302.3	3	3	3	3	3	2	3	2
B.COM 302.4	3	3	3	3	3	2	3	3
Average	2.75	3	3	3	3	2	2.5	2.25

**Table 3: CO-PSO matrix for the course B.COM 302 (INCOME TAX LAW & PRACTICE-I)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 302.1	3	3	3	3
B.COM. 302.2	3	3	3	3
B.COM. 302.3	3	3	3	2
B.COM. 302.4	3	3	3	3
Average	3	3	3	2.75

**Table 2: CO-PO matrix for the course B.COM 303 (ADVERTISING)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 303.1	3	2	3	3	3	3	3	2
B.COM 303.2	3	2	2	3	2	3	3	2
B.COM 303.3	3	2	2	3	2	3	3	2
B.COM 303.4	3	3	3	3	2	3	3	3
Average	3	2.25	2.75	3	2.25	3	3	2.25

**Table 3: CO-PSO matrix for the course B.COM 303 (ADVERTISING)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 303.1	3	3	3	3
B.COM. 303.2	3	3	3	3
B.COM. 303.3	3	3	3	3
B.COM. 303.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 304 (BUSINESS LAWS)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 304.1	3	2	3	3	3	3	3	2
B.COM 304.2	3	3	3	3	3	3	3	3
B.COM 304.3	3	3	3	3	3	3	3	3
B.COM 304.4	3	2	2	3	3	3	3	3
Average	3	2.5	2.75	3	3	3	3	2.75

**Table 3: CO-PSO matrix for the course B.COM 304 (BUSINESS LAWS)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 304.1	3	3	3	3
B.COM. 304.2	3	3	3	3
B.COM. 304.3	3	3	3	3
B.COM. 304.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 305 (COMPUTER APPLICATIONS IN BUSINESS)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 305.1	3	2	3	2	2	3	3	2
B.COM 305.2	3	2	3	2	2	3	3	2
B.COM 305.3	3	2	3	2	2	3	3	2
B.COM 305.4	3	2	3	2	2	3	3	2
Average	3	2	3	2	2	3	3	2

**Table 3: CO-PSO matrix for the course B.COM 305 (COMPUTER APPLICATIONS IN BUSINESS)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 305.1	3	2	3	2
B.COM. 305.2	3	2	3	2
B.COM. 305.3	3	2	3	2
B.COM. 305.4	3	2	3	2
Average	3	2	3	2

**Table 2: CO-PO matrix for the course B.COM 306 (FOREIGN TRADE: PROCEDURES & DOCUMENTATION)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 306.1	2	2	2	2	3	3	2	2
B.COM 306.2	3	2	3	3	3	3	3	3
B.COM 306.3	3	3	3	3	3	3	3	3
B.COM 306.4	3	3	3	3	3	3	3	3
Average	2.75	2.5	2.75	2.75	3	3	2.75	2.75

**Table 3: CO-PSO matrix for the course B.COM 306 (FOREIGN TRADE: PROCEDURES & DOCUMENTATION)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 306.1	2	3	3	3
B.COM. 306.2	3	3	3	3
B.COM. 306.3	3	3	3	3
B.COM. 306.4	3	3	3	3
Average	2.75	3	3	3



**Table 2: CO-PO matrix for the course B.COM 401(CORPORATE ACCOUNTING-II)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 401.1	3	2	3	3	3	3	3	2
B.COM 401.2	3	2	3	3	3	3	3	2
B.COM 401.3	3	3	3	3	3	3	3	2
B.COM 401.4	3	2	3	3	3	3	3	2
Average	3	2.25	3	3	3	3	3	2

**Table 3: CO-PSO matrix for the course B.COM 401 (CORPORATE ACCOUNTING-II)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 401.1	3	3	3	3
B.COM. 401.2	3	3	3	3
B.COM. 401.3	3	3	3	3
B.COM. 401.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 402 (INCOME TAX LAW & PRACTICE-II)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 402.1	3	2	2	3	3	2	3	2
B.COM 402.2	3	2	3	3	3	2	3	2
B.COM 402.3	3	2	2	3	2	2	2	2
B.COM 402.4	3	2	2	3	2	2	3	2
Average	3	2	2.25	3	2.5	2	2.75	2

**Table 3: CO-PSO matrix for the course B.COM 402 (INCOME TAX LAW & PRACTICE-II)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 402.1	3	3	3	3
B.COM. 402.2	3	3	3	3
B.COM. 402.3	3	3	3	3
B.COM. 402.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 403 (COST ACCOUNTING)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 403.1	3	3	3	3	3	3	3	3
B.COM 403.2	3	3	3	3	3	3	3	3
B.COM 403.3	3	3	3	3	3	3	3	3
B.COM 403.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course B.COM 403 (COST ACCOUNTING)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 403.1	3	3	3	3
B.COM. 403.2	3	3	3	3
B.COM. 403.3	3	3	3	3
B.COM. 403.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 404 (COMPUTERIZED ACCOUNTING SYSTEM)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 404.1	3	2	2	3	2	2	3	2
B.COM 404.2	3	2	2	3	2	3	3	2
B.COM 404.3	3	2	2	3	2	3	3	2
B.COM 404.4	3	3	3	3	2	3	3	2
Average	3	2.25	2.75	3	2	2.75	3	2.25

**Table 3: CO-PSO matrix for the course B.COM 404 (COMPUTERIZED ACCOUNTING SYSTEM)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 404.1	3	2	2	1
B.COM. 404.2	3	2	2	2
B.COM. 404.3	3	2	3	1
B.COM. 404.4	3	2	3	1
Average	3	2	2.5	1.25

**Table 2: CO-PO matrix for the course B.COM 405 (PERSONAL SELLING AND SALESMANSHIP)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 405.1	3	3	3	3	3	3	3	3
B.COM 405.2	3	3	3	3	3	3	3	3
B.COM 405.3	3	3	3	3	3	3	3	3
B.COM 405.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course B.COM 405 (PERSONAL SELLING AND SALESMANSHIP)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 405.1	3	3	3	3
B.COM. 405.2	3	3	3	3
B.COM. 405.3	3	3	3	3
B.COM. 405.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course B.COM 406 (E-COMMERCE)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
B.COM 406.1	3	2	3	3	3	2	3	3
B.COM 406.2	3	2	3	3	3	3	3	3
B.COM 406.3	3	3	3	3	3	3	3	3
B.COM 406.4	3	3	3	3	3	3	3	3
Average	3	2.5	3	3	3	2.75	3	3

**Table 3: CO-PSO matrix for the course B.COM 406 (E-COMMERCE)**

	PSO1	PSO2	PSO3	PSO4
B.COM. 406.1	3	3	3	3
B.COM. 406.2	3	3	3	3
B.COM. 406.3	3	3	3	3
B.COM. 406.4	3	3	3	3
Average	3	3	3	3

**Table 4: CO-PO-PSO mapping matrix for all the courses of: (B.COM. CBCS)**

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
<b>B-COM 301</b>	2.25	1.75	2.5	3	3	2.75	3	2	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 302</b>	2.75	3	3	3	3	2	2.5	2.25	<b>3</b>	<b>3</b>	<b>3</b>	<b>2.75</b>
<b>B-COM 303</b>	3	2.25	2.75	3	2.25	3	3	2.25	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 304</b>	3	2.5	2.75	3	3	3	3	2.75	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 305</b>	3	2	3	2	2	3	3	2	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>
<b>B-COM 306</b>	2.75	2.5	2.75	2.75	3	3	2.75	2.75	<b>2.75</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 401</b>	3	2.25	3	3	3	3	3	2	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 402</b>	3	2	2.25	3	2.5	2	2.75	2	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 403</b>	3	3	3	3	3	3	3	3	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 404</b>	3	2.25	2.75	3	2	2.75	3	2.25	<b>3</b>	<b>2</b>	<b>2.5</b>	<b>1.25</b>
<b>B-COM 405</b>	3	3	3	3	3	3	3	3	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>B-COM 406</b>	3	2.5	3	3	3	2.75	3	3	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

**B-COM 301**  
**CORPORATE ACCOUNTING-I**

External M.M.: 120  
Internal M.M.: 30

External M.P.M.: 48  
Internal M.P.M.: 12  
Time: 3 Hours  
Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each

**Course Learning Outcomes**

After completing the course, the student shall be able to:

CO1: Know the accounting for Share & Debentures.

CO2: Understand the procedure of buyback of shares.

CO3: Prepare fund accounts of companies.

CO4: Understand the accounting treatment for amalgamation of companies.

**Course Contents**

Accounting for share capital & debentures: issue, forfeiture and reissue of forfeited shares; Book building: concept & process; issue of right and bonus shares; buy back of shares; redemption of preference shares; issue and redemption of debentures.

Final accounts of companies (with adjustments excluding computation of managerial remuneration).

Amalgamation of companies: concept and accounting treatment as per accounting standard 14 (excluding intercompany holdings).

Internal reconstruction: concept and accounting treatment excluding scheme of reconstruction.

**REFERENCES**

- Gupta, Nirmal. Corporate Accounting, Sahitya Bhawan, Agra
- Jain, S.P. and K.L. Narang. Corporate Accounting, Kalyani Publishers, New Delhi.
- Maheshwari, S.N. and S. K. Maheshwari. Corporate Accounting, Vikas Publishing House, New Delhi.
- Monga, J.R. Fundamentals of Corporate Accounting, Mayur Paper Backs, New Delhi.
- Naseem Ahmed, Corporate Accounting, ANE Books Pvt. Ltd. New Delhi.
- Sehgal, Ashok and Deepak Sehgal. Corporate Accounting, Taxman Publication, New Delhi.
- Shukla, M.C., T.S. Grewal, and S.C. Gupta. Advanced Accounts, S. Chand & Co., New Delhi.



**B-COM 302**  
**INCOME TAX LAW & PRACTICE-I**

External M.M.: 120  
Internal M.M.: 30

External M.P.M.: 48  
Internal M.P.M.: 12  
Time: 3 Hours  
Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each

**Course Learning Outcomes**

After completing the course, the student shall be able to:

CO1: Understand the Basic Concepts of Income Tax.

CO2: Determine the residential status & scope of total Income.

CO3: Compute Tax Liability under various heads.

CO4: Understand and apply the provisions regarding clubbing of Income & Set off & carry forward of losses.

**Course Contents**

Introduction to income tax: Basic concepts, Assessee, person, previous year, financial year, assessment year, income, gross total income: agricultural income, casual income, exempted income, taxable income. Tax Management: tax evasion, avoidance, and tax planning, methods of tax planning.

Basis of charges: scope of total income, residence and tax liability.

Heads of income: income from salary, house property; profit and gains from business and profession, capital gains and other sources.

Clubbing and aggregation of income.

Provisions regarding set-off and carry forward of losses.

**REFERENCES**

- Gaur and Narang, Income Tax Law & Practice, Kalyani Publishers, Jalandhar.
- Girish Ahuja and Ravi Gupta, Systematic Approach, C.C.H. India Publications, New Delhi.
- Mehrotra H.C., Income Tax Law & Account, Sahitya Bhawan Publications, Agra.
- Prasad, Bhagwati, Income Tax Law & Practice, Wishwan Prakashan, Bhopal.
- Singhania V.K., Student's Guide to Income Tax, Taxmann Publications Pvt. Ltd., New Delhi.

**B-COM 303  
ADVERTISING**

External M.M.: 120

Internal M.M.: 30

External M.P.M.: 48

Internal M.P.M.: 12

Time: 3 Hours

Credits: 6

**Note: Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each**

**Course Learning Outcomes**

After completing the course, the student will be able to:

CO1: Understand the conceptual and applicative knowledge about advertising and its various aspects.

CO2: Demonstrate an understanding of consumer behaviour and communication process.

CO3: Apply the understanding of creative aspects of advertising and advertising media.

CO4: Analyse the effectiveness of advertising, role of advertising agency and new trends in advertising.

**Course Contents**

Fundamentals of Advertising: Origin and development of Advertising, definition, nature, scope, importance, objectives and functions of advertising.

Aspects of Advertising: Economic, legal, ethical, social aspects of advertising.

Consumer Behaviour: Decision making process & determinants the communication process; setting advertising objectives and DAGMAR Approach; Advertising Budget.

Creative Aspects of Advertising: Advertising creativity; Advertising appeals; Message design and development; Copy writing.

Advertising Media: Types of media, Media planning and scheduling.

Advertising Effectiveness: Concept, benefits & limitations, measuring advertising effectiveness: Pre, post and concurrent tests.

Advertising Agency: Concept, role & organisation of advertising agency.

Emerging trends in advertising and role of traditional and modern media in advertising.

**REFERENCES**

- George E Belch, Michael A Belch and Keyoor Purani, Advertising and Promotion: An Integrated Marketing Perspective, McGraw Hill Education, New Delhi.
- S Wats Dunn and Arnold M Barban, Advertising: Its Role in Marketing, Dryden Press.
- Gupta, Ruchi, Advertising, Scholar Tech Press.
- Sharma, Kavita, Advertising: Planning and Decision making, Taxman Publication Pvt. Ltd.
- Kapoor Neeru, Advertising and Personal Selling, Pinnacle.
- Shah, Kruti and A. D'Souza, Advertising and Promotions: An IMC Perspective, McGraw Hill Education.

- Kotler Philip and Eduardo Roberto, Social Marketing Strategies for Changing Public Behaviour, 1989, The Free Press, New York.
- Sontakki, Advertising, Himalaya Publishing House.
- Mahendra Mohan, Advertising Management: Concepts and Cases, Tata McGraw Hill.
- Terence A Shimp, Advertising and Promotion: An IMC Approach, Cengage Learning.
- Jaishree Jethwaney and Shruti Jain, Advertising Management, Oxford University Press, 2012.
- William Arena, Michael Weigold and Christian Arena, Contemporary Advertising, 2017, 15th Edition Hills Higher Education.

**B-COM 304  
BUSINESS LAWS**

External M.M.: 120  
Internal M.M.: 30

External M.P.M.: 48  
Internal M.P.M.: 12  
Time: 3 Hours  
Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each

**Course Learning Outcomes**

After completing the course, the student shall be able to:

- CO1: Apply the understanding of various provisions of contracts including special contracts and legitimate rights and obligations of buyer and seller for making the business agreements and contracts.
- CO2: Make choice of appropriate negotiable instruments among the different instruments described under Negotiable Instruments Act.
- CO3: Apply skills to initiate entrepreneurial ventures as partnership and LLP.
- CO4: Analyse the fundamentals of Internet based activities under the Information and Technology Act.

**Course Contents**

**Law of Contract, 1872:** nature and classification of contract; offer and acceptance; capacity of parties to contract; free consent; consideration; legality of object; agreement declared void; performance of contract; discharge of contract; remedies for breach of contract; contingent contracts; quasi contracts.

**Special Contracts:** indemnity & guarantee; bailment and pledge; contract of agency.

**Sale of Goods Act, 1930:** formation of contract of sale; goods and their classification; price; conditions and warranties; transfer of ownership in goods including sale by non-owners; performance of the contract of sale; remedies: unpaid seller and his rights, buyer's remedies; auction sale.

**Negotiable Instruments Act, 1881:** scope, features and types; negotiation; crossing; dishonor and discharge of negotiable instruments.

**Indian Partnership Act, 1932:** nature of firm; duties and rights of partners; relations of partners to third parties; liabilities of firm and partner, minor, reconstitution of partnership firm; dissolution of a firm and consequences; settlement of accounts; registration of firms; effect of non-registration.

**Limited Liability Partnership Act, 2008:** meaning, characteristics of Limited Liability Partnership (LLP); incorporation of LLP; partners and their relations; extent and limitation of liability of LLP and partners; accounts, audit and taxation of LLP; conversion to LLP from firm/private company/unlisted public company; whistle blowing; winding up and dissolution of LLP.

**Information Technology Act, 2000:** purpose; digital signature; electronic governance; attribution, acknowledgement and dispatch of electronic records; certifying digital signature; duties of subscribers; penalties and adjudication offences.

## REFERENCES

- Aggarwal Rohini, Mercantile & Commercial Laws, Taxmann Allied Services (P) Ltd., New Delhi.
- Bulchandani, K.R., Business Laws, Himalaya Publishing House, New Delhi.
- Dagar, Inderjeet and Agnihotri, Anurag. Business Laws: Text and Problems, Sage Publication
- Datey, V.S., Business and Corporate Laws, Taxmann Publications, New Delhi.
- Gulshan, S.S., Mercantile Law, Excel Books, New Delhi.
- Information Technology Rules 2000 with Information Technology Act 2000, Taxmann Publications Pvt. Ltd., New Delhi.
- Kapoor, N.D., Business Law, Sultan Chand & Sons, New Delhi.
- Kuchhal, M.C., Kuchhal Vivek, Business Legislation for Management, Vikas Publishing House Pvt. Ltd., New Delhi.
- Singh, Avtar, The Principles of Mercantile Law, Eastern Book Company, Lucknow.
- Tulsian, P.C., Business Laws, Tata McGraw Hill, New Delhi.

**B-COM 305**  
**COMPUTER APPLICATIONS IN BUSINESS**

External M.M.: 40  
Internal M.M.: 10

External M.P.M.: 16  
Internal M.P.M.: 04  
Time: 3 Hours  
Credits: 2

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of four short types questions carrying five (2) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 08 marks each

**Course Learning Outcomes**

After studying this course, the students will be able to:

CO1: Understand the basic framework of a computer system, including its components, being used in various platforms to assist the business.

CO2: Know the basics of software used to operate and manage the computer systems, including modern operating systems.

CO3: Conceptualize various application software, such as office suite, etc.

CO4: Practically work on application software – word processors, spreadsheets, presentation software, etc.

**Course Contents**

Introducing Today's Technologies – Computers, Devices, and the Web: Today's Technology  
Computers – Types of Computers: Servers-Mobile Devices; Game Devices; Embedded Computers - Generations of Computers; Changing formats of input and output devices, Smart devices; Basics of CUI and GUI

Processors, Memory, Adapters and Buses: Inside the case: Motherboard – Processors – Memory  
- Adapters Digital Storage: Storage Hard Drives -Portable Flash Memory Storage -Optical Discs  
- Enterprise Storage

Introduction to operating system: types and function of operating system; Real-time applications; Operating systems for Tabs, mobile phones, Android, etc.

Computer software: introduction, types of software: system, application and utility software; Using the Start Menu –Control Panel – Using multiple windows – Customizing the Desktop – Windows and Linux, and accessories (Latest versions of Windows and Linux Ubuntu/Debian/Red Hat/Mint, etc); Utility software – antivirus, etc.

Programming languages – conceptual framework only; Application software: concept, types including the concept of free /Open source and proprietary software; Spreadsheets- Excel, Calc, Apple i-work Numbers; Word processors – MS Word, Libre Word, Open Office, Text Edit by Apple; Database management software- MS Access an overview. Application of Power Point Presentation and Libre Impress.

Internet & Browsing: Services available on internet – WWW – ISP – Browsers. Multimedia: Application of multimedia – Images – Graphics-Audio and Video.

**Practical:** The teacher will formulate 10-15 practical tasks on enabling the student to work on the Operating Systems – Latest version of Windows and Linux; Understand components of computers and be familiar with their usage, including printers, projectors, etc. Business applications of Word Processor (MS Word and Open Office/ Libre Word); Spreadsheet (Excel and Calc); Make Presentations on Power Point

and Libre Impress. Students should devote at least 50% of their classroom time for doing the practical exercise and also make a practical notebook under the supervision of the teacher.

### **REFERENCES**

- Leon, Alexis: Fundamental of Information Technology, Vikas Publication House (P) Ltd., New Delhi
- Mansfield, Ron: The Compact Guide to Microsoft Office, BPB Publication, Delhi.
- Minoli, Daniel, Internet and Intranet Engineering, Tata McGraw-Hill Publishing Co Ltd., New Delhi.
- Saxena, Sanjay: A First Course in Computer, Vikas Publication House (P) Ltd., New Delhi.

## B-COM 306

### FOREIGN TRADE: PROCEDURES & DOCUMENTATION

External M.M.: 40

External M.P.M.: 16

Internal M.M.: 10

Internal M.P.M.: 04

Time: 3Hours

Credits: 2

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of four short types questions carrying five (2) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 08 marks each

### Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Gain knowledge of the terminology for foreign trade transactions.

CO2: Understand the need and types of foreign trade documents and understand the procedure for obtaining export import license.

CO3: Apply the understanding of different foreign trade procedures and documents for processing foreign trade transactions.

CO4: Understand the recent regulations relating to India's foreign trade transactions

### Course Contents

INCO TERMS and international price quotations;

Foreign trade documents: need, rationale and types; Procedure for obtaining export and import license.

Export procedures and documentation: letter of credit, proforma invoice, bill of lading; Steps involved in processing of an import/export order.

Recent foreign trade policy: regulations, and export promotion measures.

### REFERENCES

- Landau, Alice, "The International Trade System", Routledge
- Veeramani C & Nagaraj R, "International Trade and Industrial Development in India - Emerging Trend, Pattern and Issue", Jain Book Publishing.
- Mahajan, M. I., "Export Procedures and Documentation", Snowwhite Publications, New Delhi.
- Avadhani, V. A., "International Finance", Himalaya Publishing House.
- Cherunilam, Francis, "International Trade and Export Management", Himalaya Publishing House.
- Jaiswal, Bimal, "International Business", Himalaya Publishing House.
- Jain, Khushpat S and Jain, Apexa V. "Foreign Trade - Theory, Procedures, Practices and Documentation", Himalaya Publishing House.
- Rathor, J. S. and Rathor, B. S., "Export Marketing", Himalaya Publishing House.



**B-COM 401**  
**CORPORATE ACCOUNTING-II**

External M.M.: 120  
Internal M.M.: 30

External M.P.M.: 48  
Internal M.P.M.: 12  
Time: 3 Hours  
Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each

**Course Learning Outcomes**

After completing the course, the student shall be able to:

CO1: Understand the methods of valuation of Shares & Goodwill.

CO2: Prepare the consolidated balance sheet.

CO3: Understand & prepare the accounts of Banking & Insurance Companies.

CO4: Know the procedure and accounting process for liquidation of companies.

**Course Contents**

Valuation of Shares: Need and factors affecting valuation of shares, methods of share valuation.

Valuation of goodwill: Types of goodwill, methods of Goodwill valuation, simple problem only.

Accounts of holding companies: preparation of consolidated balance sheet with one subsidiary company, relevant provisions of Accounting Standard 21.

Accounts of banking organizations.

Accounts of insurance companies.

Liquidation of companies.

**REFERENCES**

- Gupta, Nirmal. Corporate Accounting. Sahitya Bhawan, Agra
- Jain, S.P. and K.L. Narang. Corporate Accounting, Kalyani Publishers, New Delhi.
- Maheshwari, S.N. and S. K. Maheshwari. Corporate Accounting, Vikas Publishing House, New Delhi.
- Monga, J.R. Fundamentals of Corporate Accounting, Mayur Paper Backs, New Delhi.
- Naseem Ahmed, Corporate Accounting, ANE Books Pvt. Ltd. New Delhi.
- Sehgal, Ashok and Deepak Sehgal. Corporate Accounting, Taxman Publication, New Delhi.
- Shukla, M.C., T.S. Grewal, and S.C. Gupta. Advanced Accounts. Vol.-II. S. Chand & Co., New Delhi.

**B-COM 402**  
**INCOME TAX LAW & PRACTICE-II**

External M.M.: 120  
Internal M.M.: 30

External M.P.M.: 48  
Internal M.P.M.: 12  
Time: 3 Hours  
Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each

**Course Learning Outcomes**

After completing the course, the student shall be able to:

CO1: Know the deductions under Income Tax Act.

CO2: Compute Tax Liability of Individuals, HUF & Firms.

CO3: Understand and apply the provisions for TDS, Advance Payment of Tax.

CO4: Understand tax administration & procedure for filing returns.

**Course Contents**

Deductions under section 80C to 80U in computing total income.

Computation of total income and tax liability of an individual and H.U.F.

Computation of total income and tax liability of a Firm.

Deduction of tax at source; advance payment of tax.

Income tax authorities and their powers.

Procedure for assessment; different types of returns.

Procedure of filing e-return and revised return.

Recovery and refund of tax.

Penalties and prosecutions; appeals and revision.

**REFERENCES**

- Gaur and Narang, Income Tax Law & Practice, Kalyani Publishers, Jalandhar.
- Girish Ahuja and Ravi Gupta, Systematic Approach, C.C.H. India Publications, New Delhi.
- Mehrotra H.C., Income Tax Law & Account, Sahitya Bhawan Publications, Agra.
- Prasad, Bhagwati, Income Tax Law & Practice, Wishwan Prakashan, Bhopal.
- Singhania V.K., Student's Guide to Income Tax, Taxmann Publications Pvt. Ltd., New Delhi.

**B-COM 403**  
**COST ACCOUNTING**

External M.M.: 120  
Internal M.M.: 30

External M.P.M.: 48  
Internal M.P.M.: 12  
Time: 3 Hours  
Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of eight short types questions carrying five (5) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 20 marks each

**Course Learning Outcomes**

After completing the course, the student shall be able to:

CO1: Understand the methods & techniques of cost accounting.

CO2: Know the accounting procedure for materials, labour & overheads.

CO3: Understand and apply the methods of costing.

CO4: Apply cost control & cost reduction techniques.

**Course Contents**

Introduction: nature and scope of cost accounting; cost concepts & classification.

Methods of costing: unit costing; job costing; contract costing; process costing (process losses, valuation of work in progress, joint and by-products) service costing (only transport).

Materials: material planning & purchasing, pricing of material issue; treatment of material losses, material & inventory control: concept and techniques.

Labour: labour cost control procedure; labour turnover; Idle time and overtime; Methods of wage payment: time and piece rate; incentive schemes.

Overheads: classification, allocation, apportionment and absorption of overheads; under and over-absorption.

Standard costing and variance analysis: material and labour.

Cost control and cost reduction; cost audit; an overview of cost audit standards.

**REFERENCES**

- Arora, M.N. Cost Accounting – Principles and Practice, Vikas Publishing House, New Delhi.
- Jain, S.P. and K.L. Narang. Cost Accounting: Principles and Methods, Kalyani Publishers, Jalandhar.
- Lal, Jawahar. Cost Accounting, Tata McGraw Hill Publishing Co., New Delhi.
- Maheshwari, S.N. and S.N. Mittal. Cost Accounting: Theory and Problems, Shri Mahabir Book Depot, New Delhi.
- Mittal, D.K. and Luv Mittal. Cost Accounting. Galgotia Publishing Co., New Delhi.
- Nigam, B.M. Lall and I.C. Jain. Cost Accounting: Principles and Practice, Prentice Hall of India, New Delhi.
- Shukla, M.C., T.S. Grewal and M.P. Gupta. Cost Accounting: Text and Problems, S. Chand & Co. Ltd., New Delhi.

**B-COM 404**  
**COMPUTERIZED ACCOUNTING SYSTEM**

External M.M.: 80	External M.P.M.: 32
Internal M.M.: 20	Internal M.P.M.: 08
Practical M.M.: 50	Practical M.P.M.: 20
	Time: 3 Hours
	Credits: 6

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of five short types questions carrying four (4) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 15 marks each.

### **Course Learning Outcomes**

After completing the course, the student shall be able to:

- CO1: Have a comparative overview of various accounting software, including Tally ERP (latest version)
- CO2: Install and configure Tally ERP (latest version) software
- CO3: Conduct various accounting operations on Tally ERP (latest version)
- CO4: Able to do inventory management, calculate tax liability, payroll management, etc. using Tally ERP (latest version)

### **Course Contents**

Introduction to Accounting Software. Framework of Tally ERP (Latest version); Comparison of Different Business Software Like Tally, Tally ERP, Busy Lite, Odoo, K My Money etc. Comparison of ready to use and Tailored Accounting Software.

Introduction to Open Source Accounting Software - Skrooge, Akaunting, Apache OFBiz, I Dempiere, Openmiracle, GNUcash Ledger SMB, GNU Khata. Generation of Reports, Printing and emailing the reports. Representation of final outcomes using Open Source Graphical Tools, Charts and Tables.

Working on Tally: Installation of Tally, ERP9 (or Latest version) – Licensing configurations – Tally Vault Password – Security Control in Tally, ERP9 (or Latest Version) – Splitting Company Data – Backup and Restore. Types of system failures – retrieving data from created backup files.

Accounting: voucher entry, budget, cost center, balance sheet, profit and loss account, currency, debit note, credit note, interest and calculation.

Introduction to Inventory Management System, Manual vs Computerized Management of Inventory: Inventory Management using Tally - stock item, sales order, purchase order, delivery note, rejection out, etc.

Computerized Tax Liability Calculation.

Payroll: Salary Accounting – Introduction to Payroll – Payroll Masters – Payroll Vouchers – Overtime Payment – Gratuity – Advanced Payroll Transactions Basic Salary, Overtime, Bonus, Gratuity, Loan, ESI, Provident Fund, Pension, Commission.

**Practical:** This subject aims to give practical hands-on knowledge and skills to the students and they should spend at least 75% of their time on the same. Teacher shall formulate at least 10-15 problems on all aspects of computerized accounting using Tally, which should help in imparting practical understanding of the subject. The candidates should be able to make journal entries, ledger, trial balance and balance sheet and record, other business operations on computerized accounting software, such as Tally ERP (Latest Version). Students should make a practical notebook under the supervision of the teacher.

## REFERENCES

- Ashok, K. Nadhavi, Kishor K. Nadhavi, Implementary Tally 9, BPB Publications, New Delhi.
- A.K. Nadhavi, K.K. Nadhavi, Tally Instant Reference (Accounts. Inventory, Advanced), BPB Publications, New Delhi.
- Ashok K. Nadavi, Tally Training Guide (Financial Accounting, Invoicing & Inventory), BPB Publications, New Delhi.
- A.K. Nadhavi, Managing VAT with Tally 9 (Taxation), BPB Publications, New Delhi.
- A.K. Nadhavi, K.K. Nadhavi, Implementing Tally Payroll, BPB Publications, New Delhi.

**B-COM 405**  
**PERSONAL SELLING AND SALESMANSHIP**

External M.M.: 40  
Internal M.M.: 10

External M.P.M.: 16  
Internal M.P.M.: 04  
Time: 3 Hours  
Credits: 2

**Note:** Paper setter will set nine questions in all. Question No. 1 comprising of four short types questions carrying five (2) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 08 marks each

### **Course Learning Outcomes**

After completing the course, the student will be able to:

- CO1: Understand the conceptual framework and importance of personal Selling and Salesmanship.
- CO2: Understand industrial and consumer markets.
- CO3: Comprehend the process of Personal Selling.
- CO4: Understanding of various methods and documents used for controlling salesforce.

### **Course Contents**

Introduction to Personal Selling and Salesmanship: Concept, Nature, Importance; Models of Selling, Myths of Selling, Types of selling situations, Types of Sales Persons, Qualities of successful salespersons, Selling as a career.

Types of Markets: Consumer and industrial markets, assessing market conditions, buying motives and their importance; Interactive Media (Internet/Telecommunication) and Personal Selling.

Personal Selling Process: Process of effective selling, Prospecting, Pre-Approach, Approach, Presentation and demonstration, Handling and objections, Closing the sale, Post sale activities.

Controlling the Sales Force: Need, Methods – Qualitative and Quantitative; Reports and Documents: Sales Manual, Catalogue, Order Book, Cash Memo, Tour Diary, Daily and Periodical Reports.

### **REFERENCES**

- Gupta, C.B., Personal Selling and Salesmanship, Scholar Tech Press.
- Kapur Neeru, Personal Selling and Salesmanship, Pinnacle Learning.
- Traci Bild, 7 Steps to Successful Selling, Perigee TRD.
- Rachan Wilfred, Salesmanship - Enterprise Manager's Guide, Trafford Publishing.
- Spiro, Stanton and Rich, Management of the Sales Force, Mc Graw Hill.
- Russell, F. A. Beach and Richard H. Buskirk, Selling: Principles and Practices, Mc Graw Hill.
- Johnson, Kurtz and Schueing, Sales Management, Mc Graw Hill.
- Pedesson, Charles A. Wright, Milburn D. and Wetz, Barteon A, Selling: Principles and Methods, Richard, Ervin.

**B-COM 406**  
**E-COMMERCE**

External M.M.: 40  
Internal M.M.: 10

External M.P.M.: 16  
Internal M.P.M.: 04  
Time: 3 Hours  
Credits: 2

**Note: Paper setter will set nine questions in all. Question No. 1 comprising of four short types questions carrying five (2) marks each is compulsory. It covers the entire syllabus. Answer to each question should not be more than one page. Candidate is required to attempt four questions from the remaining eight questions carrying 08 marks each**

**Course Learning Outcomes**

After completing the course, the student will be able to:

CO1:Familiar with the concept of computer networking and internet

CO2:Understand the business applications of information technology

CO3:Appreciate the security issues in IT and e-commerce, including electronic payment, online purchase, etc.

CO4:Practically use the applications of e-commerce and e-governance.

**Course Contents**

Introduction to Computer Network: basic, types of networks, topologies, media, hardware and software required for networking. Introduction to internet: concept; introduction to web browsers & web servers; various types of web browsers with advantages and disadvantages; application and uses of Internet; Internet services; Hardware and software requirement for internet. Client – Server Architecture; Protocols – an overview; EDI: benefits, components of EDI, EDI implementation,

Introduction to IOT: History, Various application of IOT: Consumer applications; organizational applications; Industrial applications; Infrastructure applications; Military Applications. Enabling technologies of IOT, Architecture, Advantages and disadvantages of IOT, challenges of adopting IOT

Internet Security: Overview; Aspects & needs of security; E-mail security; Web security; Search Engines: Introduction: Search Agent, How to register to search engine, Understanding Popular search engines, Efficient searching using Google or other search engines.

Information Technology and Business: concepts of data, information and information system, effects of IT on business; Types of information system: Transaction Processing System (TPS), Management Information System (MIS).

Introduction to E-commerce; e-commerce and world wide web; benefits and limitations of e-commerce application services; e-commerce models: B2B, B2C, C2C; Electronic payment system: Credit Card, Debit card, smart card, cyber cash, Indian payment models; Crypto currency – Bitcoin, etc.;

Security issues in e-commerce; Digital Certificates; Digital Lockers, etc. M-Commerce- concept, applications and benefits.

E-governance: introduction, advantages and disadvantages of e-governance, various projects of e-governance

**Practical:**The teacher will formulate 10-15 practical tasks on enabling the student to work onInternet - search engines, communication through Internet, conduct research using online sources – surveys, research on social networking sites. Students should also be able to do online payment, online purchase, understand m-commerce applications, use of wallets, etc. Student should be familiar with e-governance initiation such as E-disha, digital locker, apps also. Students should devote at least 50% of their classroom time for doing the practical exercise and also make a practical notebook under the supervision of the teacher.

## REFERENCES

- Bajaj, Kamlesh K and Debjani Nag, E-commerce – The Cutting Edge of Business, Tata McGraw Hill (P) Ltd., New Delhi.
- Greenstein, Marilyn, and Todd M. Feinman, Electronic Commerce, Tata McGraw Hill, New Delhi.
- Leon, Alexis: Fundamental of Information Technology, Vikas Publication House (P) Ltd., New Delhi
- Minoli, Daniel, Internet and Intranet Engineering, Tata McGraw-Hill Publishing Co Ltd., New Delhi.
- Whitley, David, E-Commerce: Strategy, Technology and Applications, Tata McGraw-Hill Publishing Co Ltd., New Delhi.



Course Code	Course Name	External Marks	Internal Marks	Total Marks	Duration	L	T	P	C
<b>Semester I</b>									
BBA(Agribusiness) 101	Functional English	40	10	50	3 hours	3	3	-	2
BBA (Agribusiness) 102	Accounting Concepts and Principle	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 103	Management Concepts and Practices	80	20	100	3 hours	4	4	-	3
BBA(Agribusiness) 104	Fundamentals of Agricultural Economics	80	20	100	3 hours	4	4	-	3
BBA(Agribusiness) 105	Business Mathematics	80	20	100	3 hours	4	4	-	3
BBA(Agribusiness) 106	Professional Hindi	40	10	50	3 hours	3	3	-	2
BBA(Agribusiness) 107	Excel Applications for Business	80	20	100	3 hours	3	3	3	3
BBA (Agribusiness) 108	Evolution and Growth of Agribusiness in India	80	20	100	3 hours	4	4	-	3
*L= Lecture, T=Tutorial, P=Practical, C= Credits <b>700</b>									<b>TOTAL</b>
<b>Semester II</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BBA (Agribusiness) 201	Agribusiness Operations Management	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 202	Human Behavior in Agribusinesses	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 203	Essentials of Financial Management	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 204	Applied Macro Economics	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 205	Business Statistics	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 206	Environmental Studies	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 207	Management Accounting	80	20	100	3 hours	4	4	-	3

BBA (Agribusiness) 208	Comprehensive Voce	Viva-	50	-	50		-	-	2	2
<b>Note:</b> At the end of Second semester students have to undergo summer internship of 4-6 weeks duration in a agribusiness enterprise which shall be credited in the Third semester *L= Lecture, T=Tutorial, P=Practical, C= Credits <b>750</b>										<b>23</b>
<b>Semester III</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BBA (Agribusiness) 301	Food and Agribusiness Policy Framework in India		80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 302	Agribusiness Human Resource Management		80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 303	Agribusiness Research Methods		80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 304	Agribusiness Environment and Laws		80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 305	Agribusiness Value Chain Management		80	20	100	3 hours	4	4	-	3

Course Code	Course Name	External Marks	Internal Marks	Total Marks	Duration	L	T	P	C	
BBA (Agribusiness) 306	Facility Management in Agribusinesses	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 307	Summer Internship/ Presentations	-	50	50	2 Hours	-	3	-	2	
*L= Lecture, T=Tutorial, P=Practical, C= Credits <b>650</b>						<b>TOTAL</b>				<b>20</b>
<b>Semester IV</b>						L	T	P	C	
BBA (Agribusiness) 401	Agribusiness Supply Chain Management	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 402	Agribusiness Enterprise Resource Planning	80	20	100	3 hours	3	3	3	3	
BBA (Agribusiness) 403	Agribusiness Financing in India	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 404	Agricultural Marketing	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 405	Organisation and Management of FPOs	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 406	Data Analytics for Agribusiness Decisions	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 407	Professional Etiquettes and Practices	-	50	50	3 hours	-	-	3	2	
BBA (Agribusiness) 408	Comprehensive Viva Voce	-	-	50					2	
*L= Lecture, T=Tutorial, P=Practical, C= Credits <b>700</b>						<b>Total</b>				<b>22</b>
<b>Note:</b> At the end of fourth semester students have to undergo summer internship of 4-6 weeks duration in an agribusiness enterprise which shall be credited in the V <sup>th</sup> semester										
<b>Semester V</b>						L	T	P	C	
BBA (Agribusiness) 501	Business Ethics and Governance	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 502	Strategic Agribusiness Management	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness) 503	Agri Business Risk Management	80	20	100	3 hours	4	4	-	3	
BBA (Agribusiness)	Procurement, Storage and Distribution of Food	80	20	100	3 hours	4	4	-	3	

504	Grains in India								
BBA (Agribusiness) 505	Summer Internship/ Presentations	-	50	50	2 Hours	-	-	3	2
<b>Electives (only two papers are to be chosen)</b>									
BBA (Agribusiness) 506	Organic Food Production Practices	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 507	Fertilizer Technology and Management	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 508	Food Processing and Technology Management	80	20	100	3 hours	4	4	-	3

Course Code	Course Name	External Marks	Internal Marks	Total Marks	Duration	L	T	P	C
BBA (Agribusiness) 509	Agro-chemicals and Technology Management	80	20	100	3 hours	4	4	-	3
*L= Lecture, T=Tutorial, P=Practical, C= Credits <b>650</b> <b>TOTAL</b>									<b>22</b>
<b>Semester VI</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BBA (Agribusiness) 601	Agribusiness and International Trade	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 602	Management of Agribusiness Cooperatives	80	20	100	3 hours	4	4		3
BBA (Agribusiness) 603	Agri Commodity Derivative Trading in India	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 604	Agribusiness Entrepreneurship	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 605	Research Project*	50	-	50	3 hours		-	4	2
BBA (Agribusiness) 606	Comprehensive Viva-Voce (External)	-	-	50				4	2
<b>Electives (only two papers shall be chosen)</b>									
BBA (Agribusiness) 607	Decision-Making in Agri-Food System	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 608	Agricultural Bio-waste Management	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 609	Agribusiness Leadership in India	80	20	100	3 hours	4	4	-	3
BBA (Agribusiness) 610	Agri Inputs Marketing	80	20	100	3 hours	4	4	-	3
<b>700</b>					<b>22</b>				

- \*L= Lecture, T=Tutorial, P=Practical, C= Credits
- Industry research project on any contemporary agribusiness issues shall be submitted by a student by April 30 which shall be evaluated externally.

### Semester Wise (Synoptic) Distribution of Marks and Credits

Semesters	Semester-1	Semester-II	Semester-III	Semester-IV	Semester-V	Semester-VI	Total
Marks	700	750	650	700	650	700	4150
Credits	22	23	20	22	20	22	129

\*L= Lecture, T=Tutorial, P=Practical, C= Credits

## **BBA (Agribusiness) Detailed Syllabus**

### **Semester I**

**BBA(Agribusiness) 101: Functional English**

**Max. Marks: 50**

**External Assessment: 40**

**Internal Assessment: 10**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 5 marks each.

**Course objective:** Basic objective of this course is to prepare students and familiarize them with the fundamentals of communication practices and strategies used in businesses.

**Course Contents:** Importance and Nature of Business Communication; Effective Communication Skills; Process of Communication; basic models of Communication; Oral and Non-Verbal Communication; Barriers and Gateways in Communication; Do's and Don'ts of business writing; Writing applications: business applications (e.g. applying for a loan, salary advance, refund etc.); job application, leave application; commercial letters.

Writing business and academic reports; presentations of reports; public speaking, listening and Negotiation; conducting and attending interview and meetings. Importance of non-verbal communication: positive gestures, symbols and signs, physical appearance & the art of self-presentation & conduct.

Effective Listening; Face to Face Conversation, Telephonic conversation, Interviews. Organization Communication: components of organization communication, Internal and external communication in organization, Importance of communication management, and communication structure in an organization.

#### **Suggested Readings:**

1. Lesikar, Business Communication: Connecting in a Digital World (SIE) 13th ed., McGraw Hill Education.
2. Murphy, Effective Business Communication 7<sup>th</sup> ed. McGraw Hill Education
3. Paul, Rajendra, Business Communication, Sultan Chand and Sons
4. Samanta, R.K., Development Communication for Agriculture. B. R. Publishing Corporation, Delhi-7.
5. Sandhu, A.S., Text Book on Agricultural Communication Process and Methods. Oxford and IBH Publishing
6. Sinha, K.K., Business Communication, Galgotia Publishing Company.

## **BBA (Agribusiness)102: Accounting Concepts and Principles**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** The basic purpose of this course is to develop an insight of postulates, principles and techniques of accounting and application of financial and accounting information for Agri-business decision-making and control.

**Course Contents:** Introduction to Accounting: Meaning, nature and scope of accounting, accounting concepts, postulates and principles and accounting conventions.

Journalizing accounting transactions, their posting in ledger accounts and rules of double entry system of book keeping for three types of accounts viz., personal, real and nominal.

Preparation of trial balance, bank reconciliation statement and rectification of errors.

Preparation and significance of financial statements and the Understanding Financial Statements; Meaning and Importance of Financial Statement Analysis, Techniques of Financial Statement Analysis.

Ratio Analysis- Meaning and Importance, Classification of ratios: Liquidity ratios, Solvency/Capital Structure Ratios, Turnover ratios, Profitability ratios, Valuation ratios.

### **Suggested Readings:**

1. Anthony, R. N., Hawkins, F. D., & Merchant, K. A. (2006). Accounting: Text and Cases (12th ed.). New Delhi: Tata McGraw Hill.
2. Albrecht, W. S., Stice, D. J., E. K., Monte, R., & Swain, R.M. (2010). Accounting: Concepts and applications (11th ed.). U.S.A: South Western.
3. Belverd, E., Needles, Jr. & Powers, M. (2010). Principles of Financial Accounting (11th ed.). South Western Publication.
4. Garrison, R.H., Noreen, E.W. (2007). Managerial accounting (12th ed.). New Delhi: Tata McGraw Hill.
5. Anthony, Accounting: Text and Cases, 13 edn McGraw Hill Education
6. Khan and Jain, Management Accounting, 7th edn McGraw Hill Education



**BBA (Agribusiness) 103: Management Concepts and Practices**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

Note: The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to familiarize the students with basic management concepts and practices being used in the organization.

**Course Contents:**

**Management–** Meaning and Concept of Management, Functions of Management , Management Types and Roles, Management Skills, Rewards and Challenges of Before Managers Leadership vs. Management, Management – Science or Art ;

**Evolution of Management Thoughts and Theories–** Classical School of Management, The Integration Management School, Contingency School, Human Relations School, Neo-Human Relations Theory ; System Theory, Contingency Theory and Contemporary School ;

**Managerial Decision Making:** Decision making Environment, Levels of Decision Making, Process of Decision Making, The Decision Biases to avoid, Tools of Quantitative Decision Making, Improving Decision making Efficiency;

**Organizing and Staffing:** Organizing – Function and Principles of Organizing, Classification of Organizations; Line Organization, Line and Staff Organization, Functional Organization, and Matrix Organization; Relationship between Authority and Responsibility; Staffing, Nature of Staffing, Staffing Process;

**Managerial Ethics and Challenges in Future.**

**Suggested Readings:**

1. Robbins, S.P: Management Concepts, Pearson Education India, New Delhi.
2. Harold Koontz, Weihrich, Management: A Global and Entrepreneurial Perspective, McGraw Hill.
3. Gene Burton and Manab Thakur: Management Today - Principles and Practices, Tata Mac Graw-Hill Publishing Company Ltd. New Delhi
4. Jones and George: Contemporary Management , Tata McGraw Hill.
5. Richard L. Draft: The New Era of Management, Cengage India
6. Mullins. J.: Management and OB, 8<sup>th</sup> ed. Pearson Education
7. Stoner, J.: Management, Prentice Hall of India, New Delhi
8. Koontz: Essentials of Management, 8<sup>th</sup> ed., Tata McGraw-Hill.
9. Chandan, J.S. : Management Concepts and Strategies, Vikas Publishing House.

## **BBA (Agribusiness) 104: Fundamentals of Agricultural Economics**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to acquaint the students with concepts and techniques of the Economic Theory applicable and used in Agri- business to sharpen their decision- making.

**Course Contents:** Agricultural Economics: Meaning, definition, characteristics of agriculture, Nature and scope of agricultural economics, Distinction between agriculture and industry, Role of agriculture in economic development, Role of government interventions in agricultural development.

Planning and Agricultural Development: Meaning and objectives economic planning, benefits of planning, Agricultural development during different Five Year Plans in India, Measures of reorganization of agriculture and NITI Aayog.

Factors of production: Meaning of land and its characteristics, Labour concept, characteristics of labour and efficiency of labour, Capital concept and its characteristics, forms of capital in agriculture and process of capital formation, Organization of business firms, forms of business organizations and their characteristics.

Land reforms: Land reforms and Land tenure systems, Concepts of agricultural land holdings in India. Theory of production: Meaning, definition, types of production functions, Laws of Diminishing Marginal Returns and Elasticity of production.

Scale of production: Meaning, classification and economies of scale. Theory of costs: Meaning, definitions and different types of costs and their measurement. Revenue concept: Total revenue, average revenue and marginal revenue and profit maximization by agri business enterprises.

### **Suggested Readings:**

1. Amarjit Singh, Sadhu, A.N., Jasbir Singh, Fundamentals of Agriculture Economics, Himalaya Publishing House
2. Subba, Reddy, Agricultural Economics, Oxford & IBH Publishing Co. Pvt. Ltd.
3. John B, Pension et.al, Introduction to Agricultural Economics, 6<sup>th</sup> ed. , Pearson
4. Gopal Chandra De, Fundamentals of Agronomy, Oxford & IBH Publishing Co. Pvt. Ltd.
5. Thomas & Maurice, Managerial Economics: Concepts and Applications (SIE) 9<sup>th</sup> ed. McGrawHill Education
6. Peterson, Lewis, Managerial Economics, Prentice Hall of India, N. Delhi.
7. Dwivedi, D.N. Managerial Economics, Vikas Publishing House, New Delhi

**BBA (Agribusiness) 105: Business Mathematics**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to familiarize the students with basic mathematical concepts and used in business decision making.

**Course Contents:**

**The Number System:** Introduction – Natural Numbers - Even Numbers – Odd, Numbers – Integers – Prime Numbers – Rational & Irrational numbers, Real Numbers, HCF & LCM (Simple problems).

**Theory of Equations:** Meaning - Types of Equations – Simple/ Linear Equations and Simultaneous Equations (only two variables), Elimination and Substitution Methods only; Quadratic Equation: Factorization and Formula Method ( $ax^2+bx+c=0$  form only). Business applications and Problems

Permutation and Combination, Binomial Theorem for positive integral index, Determinants and Matrices: Determinants with simple applications for solution of Linear simultaneous equations using Cramer's Rule, Matrices with simple application for solution of linear simultaneous equations using matrix inversion method.

**Elements of Calculus (Non trigonometric Applications):** Fundamental idea of Functions, Limits and Continuity (Algebraic functions only), Derivatives of algebraic functions, Rules & Formulae, 2<sup>nd</sup> - order derivatives, finding differential coefficient from the first-principle, simple applications. Basic rules of Integration of simple algebraic functions, simple applications, idea of definite Integrals and area under the curve

**Progressions & Commercial Arithmetic:** Arithmetic Progression - Finding the nth term of AP and Sum to nth term of AP. Insertion of Arithmetic Mean; Geometric Progression – Finding the nth term of GP and sum of n terms of GP and insertion of Geometric Mean.

Computations of Simple Interest, Compound Interest including half yearly and quarterly calculations, Annuities, Percentages, Bills Discounting, Ratios and proportions, duplicate-triplicate and sub-duplicate of a ratio. Proportions: third, fourth and inverse proportion - problems.

**Suggested Readings:**

1. Morrison, Karen, Hamshaw, Nick, Mathematics Core and Extended Coursebook, 2<sup>nd</sup> ed. Cambridge University Press.
2. Raghuvanshi, M, Mathematics for Management: An Introduction, McGraw Hill.
3. Khan, Shadab, A textbook of Business Mathematics, 2<sup>nd</sup> ed. Viva Books, New Delhi
4. Elhance, D.N., Business Mathematics & Statistics, Taxmann Publications, New Delhi

5. Sterling, Mary Jane, Business Math, Wiley Eastern publications, New Delhi
6. Das N, Business mathematics and Statistics, McGraw Hill, New Delhi

### BBA (Agribusiness) 106: Professional Hindi

Max. Marks: 50

External Assessment: 40

Internal Assessment: 10

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, students are required to attempt any four questions of 5 marks each.

उद्देश्य: प्रस्तुत प्रश्न-पत्र का उद्देश्य वाणिज्य एवं प्रबन्धन से जुड़े विद्यार्थियों को राजभाषा / राष्ट्रभाषा हिन्दी का व्यावहारिक ज्ञान प्रदान करना है, ताकि वे जनसामान्य तक अपनी बात, उनकी अपनी भाषा में, समझा सकें।

राजभाषा अधिनियम, राष्ट्रपति के अध्यादेश तथा केन्द्रीय सरकार की हिन्दी शिक्षण – योजना।

पत्राचार के विविध रूप (मूल पत्र, पत्रोत्तर, पावती, अनुस्मारक, अर्द्धसरकारी, झापन, परिपत्र, आदेश, पृष्ठांकन, अन्तःविभागीय टिप्पण, निविदा सूचना, विज्ञापन, प्रेस विज्ञप्ति, प्रेस नोट, प्रतिवेदन)

अनुवाद : स्वरूप, प्रकृति, प्रकिया, वर्गीकरण, व्यावहारिक अनुवाद (प्रदत्त अंग्रेजी/हिन्दी अनुच्छेद का अनुवाद), अनुमाषण (आशु अनुवाद)  
पल्लवन : परिभाषा, प्रकिया और गुण  
संक्षेपण : परिभाषा, विधि और गुण

पारिभाषिक शब्दावली (मंत्रालयों, उपक्रमों, निगमों, बैंकों, रेलवे-क्षेत्रों, संडियां तथा दूरदर्शन में प्रयुक्त पारिभाषिक शब्दों और वाक्यांशों का अध्ययन)

निबन्ध-लेखन (निम्नलिखित विषयों में से चार-पांच विषय दिए जायेंगे, जिनमें से लगभग 300 शब्दों पर आधारित एक निबन्ध लिखना होगा)

1. वाणिज्य अध्ययन में हिन्दी की उपयोगिता
2. उपभोक्ता, बाजार और वाणिज्य
3. बैंक और वाणिज्य
4. कुशल प्रबन्धन और वाणिज्य
5. विज्ञापन और वाणिज्य
6. वाणिज्य विकास में कम्प्यूटर की भूमिका
7. श्रमिक असंतोषों का उद्योग जगत पर प्रभाव
8. जनसंख्या में वृद्धि का राष्ट्र-समृद्धि पर प्रभाव
9. अन्तर्राष्ट्रीय व्यापार और अन्तर्राष्ट्रीय मुद्रा-कोष
10. निजीकरण का भारतीय अर्थव्यवस्था पर प्रभाव
11. वैश्वीकरण और भारतीय उद्योग
12. महंगाई
13. काला धन
14. ऊर्जा संकट
15. लघु उद्योगों का भविष्य

संदर्भ ग्रन्थ

1. प्रयोजनमूलक हिन्दी : राजनाथ मट्ट, हरियाणा साहित्य अकादमी, पंचकूला-2004.
2. अनुवाद विज्ञान : राजमणि शर्मा, हरियाणा साहित्य अकादमी, पंचकूला-2004.
3. प्रामाणिक आलेखन और टिप्पण : विराज, राजपाल एण्ड सन्स, दिल्ली-2005.
4. प्रयोजनमूलक हिन्दी के छः अध्याय, दर्शन कुमार जैन, लिपि प्रकाशन, अम्बाला छावनी-1996.

## **BBA (Agribusiness) 107: Excel Applications for Business**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students learn about the application of Excel tools and techniques for business decision- making.

**Course Contents:Introduction to Excel:** Basic formulae: Entering and editing data, Creating and copying formulae, Creating functions easily. Formatting: Inserting/deleting rows/columns, changing fonts, Colours and borders, Merging and aligning cells; Printing: Page break preview, Using page layout view, Headers and footers, freezing print titles; Charts: Selecting data, Quick ways to create charts, Formatting charts. Preparation of Basic tables: Table styles, Using calculated columns, Header rows and total rows, Sorting and simple filtering.

**Advanced Excel –I:** Sorting and filtering lists/tables of data. Number formatting: Creating custom formats, four parts of a format, Scaling numbers, Dates and times: Sorting on dates and times, Useful date/time functions, Formatting dates and times. **Advanced Excel – II:** Conditional formatting: Creating/using cell rules, Data bars and colour sets, Styles and themes, How themes work, Using the default styles, Creating custom styles; Validation and protection: Setting cell validation, Protecting cells/worksheets, Grouping and outlining, Cell comments Range names and absolute references: Absolute references (\$ symbol), Fixing only the row/column, Creating range names, Labelling ranges automatically. Excel Functions: Introduction to Mathematical Functions, Introduction to Text Functions, Introduction to Logical & Reference Functions, Introduction to Date & Time Functions, Introduction to Financial Functions, Introduction to Information Functions. IF and LOOKUP functions: The conditional (IF) function, Nested Ifs, Lookup functions, Advanced Tables, using calculated columns, removing duplicates, Advanced filters, Pivot tables: Creating pivot tables, swapping rows, columns and pages, grouping fields, Slicers, Pivot table slicers, Changing slicer properties. Preparation of Charts: Selecting data, Quick ways to create charts, formatting your chart, advanced charts, Creating chart templates, Combination charts, Picture charts, and Custom chart types.

### **Suggested Readings:**

1. Jordan Goldmeier, Advanced Excel Essentials, Apress.
2. Lokesh Lalwani, EXCEL 2019 All in one, 1<sup>st</sup> ed., BPB Publications.
3. Wayne L. Winston, Microsoft Excel 2019 Data Analysis and Business Modelling, 6<sup>th</sup> ed. PHI Learning Pvt. Ltd.
4. Ken Bluttman, Excel Formulas & Functions, 5<sup>th</sup> ed., Wiley
5. Nigam, Manisha, Advanced Analytics with Excel 2019, 2<sup>nd</sup> ed., BPB Publications.

## **BBA (Agribusiness) 108: Evolution and Growth of Agribusiness in India**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students aware on the emergence agriculture business opportunities in historical perspective to drive cues to future opportunities in this regard.

### **Course Contents**

A review of Agricultural practices in Indian subcontinent in ancient, medieval and modern India; subsistence agriculture, land revenue collection practices and sustenance of Indian agriculture overtime. A brief review of Indian geospatial topography and its suitability of agricultural crops.

Indian climate ecosystems and Indian irrigation system, canal system, tube-well and drip irrigation, seasonality of Indian agriculture, Agriculture produce pricing practices.

A genesis of cash crops; horticulture and spices cultivation, tea plantations, dairying, animal husbandry, poultry and Pisces farming in India.

A brief review of Farm-market integration ecosystem in India, farm innovation and technology adoption in Indian agriculture. Storage and warehousing of Indian farm produce. Indian farm value chain analysis, challenges and sustainability of farm operations in India.

Challenges of Food processing industry and the Contemporary issues in Indian agriculture. Changes in India food habits and the reorientation of food processing in India in recent times.

### **Suggested Readings:**

1. Subba , Reddy, Agricultural Economics, Oxford & IBH Publishing Co. Pvt. Ltd.
2. Gopal Chandra De, Fundamentals of Agronomy, Oxford & IBH Publishing Co. Pvt. Ltd.
3. Thomas & Maurice, Managerial Economics: Concepts and Applications (SIE) 9<sup>th</sup> ed. McGrawHill Education
4. Peterson, Lewis, Managerial Economics, Prentice Hall of India, N. Delhi.
5. Dwivedi, D.N. Managerial Economics, Vikas Publishing House, New Delhi

## BBA (Agribusiness) Semester II

### BBA (Agribusiness) 201: Agribusiness Operations Management

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students aware of the process of agriculture business operations to better understand the underlying value creation process .

**A brief review of Agribusiness and the** Difference between Production and Operations Management, Productivity, Work Study, Productivity measurement, Factors affecting Productivity, Production Technology: Types of Manufacturing Processes

**Operations Concept in agribusiness and the** Difference between Product and Service, Product and Service Design, Characteristics of Service, Classification of Service, Factors Affecting Service Operation, Service Capacity Planning, SERVQUAL Model of Measuring Service Quality

**Agribusiness Material and Inventory Management:** Types of production planning, Process of Production planning and Control (PPC) Routing, Scheduling, Loading, Just-in-time (JIT), KANBAN VIEW, Types of inventories, Factors Affecting Plant Location, Inventory Control Technique, Types of Plant layout.

**Agribusiness Supply Chain Management** Conceptual model of SCM, Supply Chain Drivers, Demand Forecasting in Supply Chain, Simple Moving Average, Weighted Moving Average, Exponential Smoothing Method, VIEW, Supply Chain efficiency, Core and Reverse Supply Chain, International Supply Chain, Aggregate Planning, Inbound and Outbound SCM, Bullwhip Effect in SCM, Latest Trends in Production and Operation Lean Manufacturing

**Agribusiness Productivity and Quality considerations;** TQM, Deming's 14 Principles, Continuous Improvement (Kaizen), PDCA Cycle, Quality Circles, 7QC Tools and its Advancements, ISO 9000-2000 clauses, Six Sigma, Total Productive Maintenance (TPM), 5S

### **Suggested Readings**

1. Prof. L. C. Jhamb: Production (Operations) Management, Everest Publishing House.
2. Upendra Kachru: Operations Management, Excel Books.
3. P. Sunderashan Gopalakrishnan: Handbook of Materials Management, PHI.
4. R. Mishra- Materials Management, Excel Books
5. S. N. Chary – Production and Operations Management, TMGH
6. K. Sridhara Bhat: Production and Materials Management, Himalaya Publishing House

**BBA (Agribusiness) 202: Human Behaviour in Agribusinesses**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students aware of the process of understanding human behavior in agriculture businesses.

**Course Contents:**

Organisational Behavior – Nature and Scope, Challenges and opportunities for OB Professionals , Organization Goals, Models of OB, Impact of Global and Cultural diversity on OB;

Understanding Individual Behaviour: Personality, Perception and its role in individual decision making, Learning, Motivation –Meaning, Importance and Content and Process Theories of Motivation;

Interpersonal Behaviour and Communication - Transaction Analysis, The Johari Window, Leadership, Meaning and Theories , Prevailing Leadership styles in Indian business organizations;

Understanding Group Behavior: Definition and classification of Groups, Types of Group Structures, Group decision making, Teams Vs Groups, Contemporary issues in Managing Teams, Inter-group problems in organizational, Management of Organisational Conflict;

Organisational Change and Development: Concept, Importance and Forces for Change, Resistance to organizational change, Approaches to Managing Organizational Change, Organisational effectiveness, Organisational culture, Power and Politics in Organisations.

**Suggested Readings:**

1. Fred Luthans 1998. Organizational Behavior. Tata McGraw Hill.
2. Harold Koontz & Keing Weighrich. Essentials of Management. McGraw Hill.
3. John W Newstrom & Keith Davis. 1997. Human Behaviour at Work. Tata McGraw.
4. Robert C Appleby. 1997. Modern Business Administration. Macmillan India.
5. Stephen P Robbins 2007. Organizational Behaviour. Prentice Hall.
6. Stoner James AF. 2005. Management. Pearson Edu.



## **BBA (Agribusiness) 203: Essentials of Financial Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students aware of the financial management essentials in food processing and agribusinesses.

### **Course Contents:**

Meaning and Definition of Financial Management, Goals of Financial Management, Finance, Risk-return trade-off, Agency problem, Emerging roles of financial managers in agribusiness in enterprises in India; Time Value of Money: Future, Value, Present Value, Annuity, Perpetuity  
Sources of finance: short term and long term finance, Leverages: Operating leverage, financial leverage and Combined leverage, EBIT-EPS analysis, Cost of capital: Cost of equity, Cost of preference shares, Cost of debt, Weighted average cost of capital (WACC). Essentials of pecking order theory.

Capital Budgeting – Meaning, Capital budgeting Process; Project Classification; Evaluation Techniques – Payback period, ARR, Discounted payback period; NPV, PI, IRR, Accept/reject criteria.

**Management of Working Capital:** Concepts of working capital, Operating and cash conversion cycle, Permanent and variable working capital, balanced working capital position, Determinants of working capital, Issues in working capital management, Estimating working capital requirement.

**Dividend Policy and Capital Structure:** Meaning of dividend policy, factors influencing dividend policy, objectives of dividend policy, stability of dividends, forms of dividend; Meaning of Capital Structure, factors determining capital structure, capital structure planning and policy, approaches to establish target capital structure.

### **Suggested Readings:**

1. Chandra Prasanna, 2000. Financial Management. Tata McGraw Hill.
2. Khan MY & Jain PK. 2004. Financial Management: Text, Problems and Cases. Tata McGraw Hill.
3. Pandey IM. 1997. Financial Management. Vikas Publ.
4. Ramachandran N & Kakani RK. 2005.
5. Financial Accounting for Management. Tata McGraw Hill.
6. Van Horne JC. 1997. Financial Management and Policy. Prentice Hall.

## **BBA (Agribusiness) 204: Applied Macro Economics**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students aware of the macroeconomic forces applicable to agribusinesses for a holistic understanding of business opportunities.

**Course Contents:** **Introduction to Macro Economics;** difference between macro and micro economics, The central choices of economic decision making: what, how and for whom to produce? The participants in the market economy, Economic concepts of scarcity, choice, opportunity cost, Marginal analysis and choice, Ceteris Paribus or 'everything else held constant.' Economic systems – the market economy, mixed economies & command economies, the concept of opportunity cost/tradeoffs and to marginal, costs and benefits; increasing marginal opportunity costs., Productive efficiency; inefficient choices and unattainable choices.

**Supply and Demand for Product and Resource Markets –** Role of households (consumers) and firms, Consumer demand and the "Law of Demand" Law of Demand: the inverse relationship between price and quantity demanded, Change in quantity demanded vs. shift in demand, Causes of a shift in demand: changes in income, expectations, number of consumers, tastes and preferences; Law of Supply: The positive relationship between price and quantity supplied. Change in quantity supplied vs. a shift in supply Causes of a shift in Supply: changes in cost of resources, prices of related goods, technology, expectations of producers, number of producers Market demand, market supply and market equilibrium Government price controls: price ceilings, price floors (shortages and surpluses).

### **Macroeconomics: The Big Picture**

The Business Cycle in Market Economies; short-term vs. long-term growth trend Expansion, peak, decline, trough Emergence of modern- day macroeconomic policy to moderate effects of recessions: Keynesian policy/government spending and taxation to stimulate aggregate demand Components of aggregate demand and aggregate supply Shifts in the AD and AS curves.

The Keynesian short-run model and the classical economists' long-run model Keynes' challenge to Say's Law: the Demand Driven Economy, Wage and Price inflexibility; role of Government Concerns of Inflation (boom times) and deflation (severe economic downturns) The impact of

recession on trade imbalances Are all recessions the same? Comparisons of the recent “Great Recession” to the Great Depression (1930 – 1939).

**Unemployment and Inflation:** Types of unemployment. Labour force participation rate. Inflation: What does it say about the state of the economy? Real vs. nominal income and earnings Real and Nominal rates of interest Costs and causes of inflation.

**Fiscal policy & Monetary Policy:** Defining fiscal policy: taxation and spending to achieve macroeconomic goals, multiplier effect, Government spending and taxation Automatic stabilizers: the income tax, unemployment insurance, Discretionary tax and spending policy Progressive, proportional and regressive taxes and their impacts, Fiscal Policy Lags, Budget deficits and surpluses.

Monetary Policy: Reserve requirements, the discount rate, open market operations; the goals of monetary policy, The role of credit, debit cards and electronic money in the money supply Role of financial intermediaries – modern depository institutions.

**Suggested Readings:**

1. Panchanan Das, Anindita Sengupta-Economics I: Oxford.
2. S.Mukherjee, M. Mukherjee & A. Ghose : Microeconomics, Prentice-Hall.
3. Koutsoyianni : Modern Micro-Economics, Macmillan
4. Vinita Agarwal: Managerial Economics, Pearson
5. Debes Mukherjee: Essentials of Micro and Macro Economics, Central
6. R. G. Hubbard & O’Brien: Microeconomics, Pearson

## **BBA(Agribusiness) 205: Business Statistics**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objectives:** The objective of this course is to make the students aware of the statistical tools and methods applicable to agribusinesses for analysis and understanding of business profitable business opportunities.

### **Introduction to statistics**

Introduction, Scope and Applications of statistics in Business- Index Numbers and Time Series. Collection of: primary and secondary data, Methods of collection. Presentation of data: Mode of presentation of data, Frequency distribution, Graphic representation of data.

### **Quantitative tools used in business and risk management**

Averages: Meaning and Importance, Arithmetic Mean, Median and Mode: Definition, computation by Direct Method, Deviation Method, Step Deviation Method, Measures of dispersion, Range-Quartile deviation- Mean deviation, Standard Deviation: Definition, computation by Direct Method, Deviation method, Step deviation method Co-efficient of Variation. Permutations and Combinations-Definition, Formula and examples.

### **Business variables through correlation and regression analysis**

Introduction, Correlation analysis, Measures of correlation: Scatter diagram, Karl Pearson's Co-efficient of Correlation. Spearman's Rank Correlation. Meaning of Regression Analysis, Regression Lines and Equations, Probability definition and examples.

### **Arithmetic For Management of Business and Transactions with Banks**

Percentage, Profit, and Loss, and Partnerships, Trade Discount and Cash Discount, Simple Interest and Compound Interest. True Discount, Bankers Discount and Bankers Gain, EMI calculation using Interest on reducing balance and Flat Interest rate.

### **Suggested Readings**

1. N.G Das: Statistical Methods (Volume I): Tata McGraw-Hill.
2. A.M Goon, M.K Gupta & B, Dasgupta: Basic Statistics : World Press
3. G. C. Beri : Statistics for Management: Tata McGraw- Hill
4. Bharat Jhunhunwala: Business Statistics, S. Chand Publishing
5. V.K. Kapoor & S.C. Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.

## **BBA (Agribusiness) 206: Environmental Studies**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of environmental challenges in agribusinesses.

### **Course Contents:**

Renewable and non-renewable economic resources: Natural resources and associated problems.

(a) Forest resources: Use and over- exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies. (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources. · Equitable use of resources for sustainable lifestyles.

### **Ecosystems**

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

### **Biodiversity and its conservation**

Introduction – Definition: genetic, species and ecosystem diversity · Biogeographical classification of India · Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values · Biodiversity at global, national and local levels · India as a mega-diversity nation · Hot-spots of biodiversity · Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts · Endangered and endemic species of India · Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity

### **Environmental Pollution**

Definition, Causes, effects and control measures of: a. Airpollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear pollution · Solid

waste management: Causes, effects and control measures of urban and industrial wastes. · Role of an individual in prevention of pollution · Pollution case studies · Disaster management: floods, earthquake, cyclone and landslides

### **Social, Economic Issues and the Environment**

From unsustainable to sustainable development · Urban problems and related to energy · Water conservation, rain water harvesting, watershed management · Resettlement and rehabilitation of people; its problems and concerns. Case studies. · Environmental ethics: Issues and possible solutions · Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation · Consumerism and waste products · Environmental Protection Act · Air (Prevention and Control of Pollution) Act · Water (Prevention and control of Pollution) Act.

Wildlife Protection Act · Forest Conservation Act · Issues involved in enforcement of environmental legislation · Public awareness ·

### **Suggested Readings**

1. Kumarasamy, K., A.Alagappa Moses And M. Vasanthy, 2004. Environmental Studies,
2. Bharathidsan .University Pub, 1, Trichy
3. Rajamannar, 2004, Environemntal Studies, Evr College Pub, Trichy
4. Shinde, Pendse, Donge, Environmetal Education, Sheth Publication

## **BBA (Agribusiness) 207: Management Accounting**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** The basic purpose of this course is to develop an insight of postulates, principles and techniques of accounting and application of financial and accounting information for Agri-business decision-making and control.

**Course Contents:** Introduction to Management Accounting: Meaning, nature and scope of management accounting, Goals of management accounting, Role of Management Accountant, Installation of the Management Accounting System, Tools of Management Accounting, Limitations of Management Accounting, Difference between cost accounting and Management accounting, difference between management accounting and financial accounting.

Marginal Costing: Meaning, need and features of marginal costing, Marginal Costing Vs. Absorption Costing, Contribution, P/V ratio, Computation of profit using marginal costing and absorption costing, Break-even point, Break even chart, Angle of incidence, Margin of safety, Applications of Marginal Costing for Managerial Decision Making.

Budgetary Control: Meaning - budget and budgetary control, objectives, advantages and limitations of budgetary control, Classification of budgets, Preparation of flexible budget, Sales budget, Cash budget, and the preparation of Master Budget.

Standard Costing and Variance Analysis: Meaning of standard cost and standard costing - Application of standard costing, Advantages and Disadvantages of standard costing, Variance analysis: Material and Labour, Overhead variances

### **Suggested Readings:**

1. Anthony, R. N., Hawkins, F. D., & Merchant, K. A. (2006). Accounting: Text and Cases (12th ed.). New Delhi: Tata McGraw Hill.
2. Albrecht, W. S., Stice, D. J., E. K., Monte, R., & Swain, R.M. (2010). Accounting: Concepts and applications (11th ed.). U.S.A: South Western.
3. Anthony, Accounting: Text and Cases, 13 edn McGraw Hill Education
4. Khan and Jain, Management Accounting, 7th edn McGraw Hill Education

**BB Agri 207: Comprehensive Viva Voce**

**Max. Marks: 50**  
**External Assessment: 50**



## **BBA (Agribusiness) Semester III**

**BBA Agribusiness 301**

**Food and Agribusiness policy Framework in India**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of food, agriculture and agribusiness policy framework in India.

### **Course Contents:**

**Agricultural Policies:** Importance of Agribusiness in Indian Economy New Agricultural Policies National Agricultural Policy, National Seed Policy, National Price Policy, National Food Processing Policy, National Foreign Trade Policy, National Fishery Policy, National Food Security Policy, National Food & Biotech, National Transportation of Food, National Nutrient Based Subsidy

Agro-based Industries: Importance of Agro based Industries, Need of Agro based Industries, Classification of Agro based Industries, Types of Agro based Industries- Sugar Mills, Cotton Ginning Mills, Dal Mills, Rice Mills, Poha Mills, Fruit Processing Industries etc. Institutional Arrangement- Ministry of Agriculture (GOI), Financial Institutions, NABARD, NCDC, NDDDB, NCUI, APEDA, ICAR, NAFED, FCI, CWC, NHM, CFTRI, EPO, Procedure to set up agro- based Industries Constraints In establishing Agro based Industries, Agricultural Value Chain : Value Chain Concept

### **Suggested Readings**

1. Bhalla, G.S. (2007), Indian Agriculture since Independence, National Book Trust, India.
2. Chakaravathi, R. M. (1986), Under Development and Choices in Agriculture, Heritage Publication, New Delhi.
3. Eicher K.C. and J. M. Staatz (1998), International Agricultural Development, Johns Hopkins Univ. Press.
4. Frank E. (1992), Agricultural Policies in Developing Countries, Cambridge Univ. Press.
5. Ghatak, S and K. Ingersent (1984), Agriculture and Economic Development, Select Book Service Syndicate, New Delhi.
6. Jhingan, M. L. (1998), The Economics of Development and Planning, Vrinda Publ.

7. Jules, P. N. (1995), Regenerating Agriculture – Policies and Practice for Sustainability and Self Reliance, Vikas Publ. House.

**BBA Agribusiness 302: Agribusiness Human Resource Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness human resource management.

**Course Contents:**

**Introduction to Human Resource Management:** Meaning - Definitions, Objectives and Importance of HRM; Functions of HRM – Operative functions; HR Managerial Roles ; Qualification and qualities of HR Managers; Modern HRM;

**Human resource planning:** Meaning , Importance and Process of human resource planning; HRP Models and HR Forecasting Methods.

**Recruitment, Selection and Induction:**

Meaning, Sources and Stages of Recruitment, Selection and Placement, Process of Selection ,Uses of Psychological testing in Selection Process, Problems involved in placement;

**Training and Development:** Nature and Objectives of Training, Identification of Training Needs, Methods of Training and Development;

**Career and Succession Planning :** Meaning and Importance of Career and Succession Planning, promotion-Purposes and types – promotion policy– bases of promotion – seniority v/s merit– transfer, need – purposes –types of transfers- demotion –causes of demotion;

**Performance Appraisal and Management :** Meaning and Objectives, Methods of Performance Appraisal - Traditional and Modern;

**Compensation Management and Job Evaluation:** Job Evaluation- Meaning and Objective, Compensation Management- Objectives and Importance, Principles and Methods of Compensation Management.

**Work Life Balance and Well Being:** Meaning and Importance of Work Life Balance, Reasons for Work Life Imbalance and Work Life Balance Interventions.

**Suggesting Readings:**

1. Dessler&Varakkey: Human Resource Management, Pearson Education
2. K.Aswathapa : Human Resource Management: Text and Cases, 8th Ed., Tata McGraw Hill, New Delhi.

3. Aggarwala, Tanuja: Strategic HRM, Oxford University Press.2010
4. Armstrong, Michael Handbook of HRM Practice, Kogan Page,
5. V.S.P.Rao : Human Resource Management, Himalaya Publication House.
6. Ivancevich : Human Resource Management 11 thedn McGraw Hill Education
7. Seema Sanghi: Human Resource Management, Vikas Publishing House Pvt. Ltd.

## **BBA(Agribusiness)303: Agribusiness Business Research Methods**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness research tools and methods.

### **Course Contents:**

**Introduction to Business Research:** Meaning, Purpose, Motivations; Types of research; Research Approaches; Significance of research; Research methods versus methodology; Research and scientific method; Research process; Scope of business research; Review of literature: Need and Purpose

**Research Problem and Research Design** Selection and formulation of a research problem; Formulation of hypothesis, Operational definition of concepts; Sampling techniques; Research Design: Meaning, Nature; Components of research design

**Methods of Data Collection** Meaning and Types of Data, Collection of Primary Data; Observation Method; Interview Method; Collection of Data through Questionnaires and Schedules; Other Methods of Primary Data Collection; Collection of Secondary Data; Selection of Appropriate Method for Data Collection.

**Processing and Analysis of Data** Processing Operations; Problems in Processing; Types of Analysis; Statistics in Research; Measures of Central Tendency, Dispersion, Asymmetry, and Relationship; Other Measures for Analysis of Data; Testing of Hypothesis.

**Interpretation and ReportWriting** Meaning and Need for Interpretation; Techniques of Interpretation; Meaning and Significance of Report Writing; Different Steps in Report Writing; Layout of Research Report; Types of Report; Mechanics of Writing Research Report

### **Suggested Readings:**

1. Malhotra, Naresh K.: Marketing Research an Applied Orientation, 5<sup>th</sup> edition, Pearson.
2. Cooper, Business Research Methods, 11<sup>th</sup> edn McGraw Hill Education.
3. Kothari, C. R.: Research Methodology, New Age International Publishers.
4. Shekharan & Uma: Business Research Methods-A Skill- Building Approach, 7<sup>th</sup> ed., New York, John Wiley, 2002.
5. Creswell, John W.: Research Design-Qualitative & Quantitative Methods, New York, John Wiley, 2002
6. Sandhi and Chawla: Research Methodology-Concepts and cases, 1st Edition, Vikas
7. Nargundkar, Marketing Research - Text and Cases 3<sup>rd</sup> edn, McGraw Hill Education

## **BBA (Agribusiness) 304: Agribusiness Environment and Laws**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of business environment for agribusiness enterprises.

### **Course Contents:**

**An Overview of Business Environment** Type of Environment-internal, external, micro and macro environment. Competitive structure of industries, environmental analysis and strategic management. Managing diversity. Scope of business, characteristics of business. Objectives and the uses of study. Process and limitations of environmental analysis.

**Economic Environment** Nature of Economic Environment. Economic factors-growth strategy, basic economic system, economic planning, nature and structure of the economy. Economic policies-industrial policy (1991), FEMA, Monetary and fiscal policies.

**Socio-Cultural Environment** Nature and impact of culture on business, culture and globalization, social responsibilities of business. Business and society, social audit, business ethics and corporate governance. Demographic environment population size, migration and ethnic aspects, birth rate, death rate and age structure.

**Political Environment** Functions of state, economic roles of government, government and legal environment. The constitutional environment, rationale and extent of state intervention

**Technological Environment** Natural and Technological Environment Innovation, technological leadership and followership, sources of technological dynamics, impact of technology on globalization, transfer of technology, time lags in technology introduction, status of technology in India. Management of technology, features and impact of technology.

### **Suggested Readings:**

1. G.N. Pandey: Environmental Management, Vikas Publishing House Pvt. Ltd.
2. Cunningham: Environmental Science, TMH.
3. R. Rajagopalan: Environmental Studies, Oxford.
4. R. Joshi & Munish Kapila: Environment Management, Kalyani Publishers.
5. C.S. Rao: Environmental Pollution Control Engineering, New Age International Publication.
6. Wright & Nobel: Environmental Science, PHI.

**BBA (Agribusiness) 305: Agribusiness Value Chain Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness value chain management.

**Course Contents:**

**An Overview of Value Chain Management:** Global food systems and value chains Characteristics of global food systems; identify the variables impacting global food systems; identify value chain thinking and how it differs from supply chain thinking; identify the role that external factors (for example, population and income growth, globalization, climate change, technology and international trade) play on global food systems, agribusiness, and value chains; and identify the actors in, and characteristics of, value chains, demonstrated with the building of a value chain model. Agribusiness market dynamics: Characteristics of agri-food markets, identify the role that external factors, such as population and income growth, globalization, climate change, technology and international trade, play on agri-food markets; interpret the key elements of supply and demand; and recognize the basic characteristics of supply and demand curves.

**The role of the consumer:** Role the consumer plays in the food system, markets and value chains; recognize the consumer characteristics, trends and behaviour that influence value chains; and recognize some of the techniques used in market and consumer research to better understand consumer behaviour.

**Retail strategic planning and operations management** Retail strategic planning operations management, evaluating the competition in retailing, market selection and location analysis, customer services and retail selling with special reference to Agri business

**Retail merchandising** Retail merchandising, merchandise selection and planning, range planning, category management; retail pricing: strategies and techniques with special reference to food retailing.

**Suggested Readings:**

1. R. Balkrishna, Supply chain management for Indian Agriculture
2. Joel D. Wisner, G. Kleong. Keah principles of supply chain management-A Balanced approach choon tan-cengage learning.
3. How to succeed at Retail, Keith Lincoln & Lars Thomassen

## **BBA (Agribusiness) 306: Facility Management in Agribusinesses**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness facility management.

### **Course Contents:**

**Introduction to Facility Management:** A brief understanding of agribusiness Facilities Management – ‘the facilities umbrella’, Defining FM within an organization, The 8 key roles of facility management, Facility Management – overhead or profit Centre? The strategic importance of managing facilities, Developing a Facility Management plan and team, Types of planning, Strategic and annual planning, Life cycle cost principles, and Stakeholder management.

**Establishing control of support services & Focusing on the customer** Identifying and reviewing support service requirements, Profiling current service levels and costs, Reviewing contracted services, Contract ‘bundling’ and ‘aggregation’, Determining and implementing a contract strategy, Understanding customer business needs and objectives, Engaging the customer, Customer service strategy, Developing a customer action plan, The pursuit of excellence, Preventive maintenance and maintenance Strategy, Disaster recovery plans, Maintenance concepts, Understanding RISK, Risk-Based Maintenance, the methodology

**Managing the budget & Understanding service contracts** Harnessing cost data, identify spending patterns, building up the budget plan, Defending the plan, Control mechanisms and reports, how to maximize the budget. What is a contract and why do we need them? Tender terms, Objectives and understanding what the contractor wants, Contract structure explained, Terms and conditions, Specifications – output v input, Schedules of tender, Supplier ‘own’ contracts – common traps!

**In-contract management** Review and revise contract strategy objectives, building successful contract management relationships, Monitoring process step by step, Service level agreements and KPIs demystified, Reports that inform and managing contract meetings, Contract review process and dealing with contract variations, how to handle disputes and contract termination, Planning and preparing for re-tendering, Practical tips on managing support services

**Compliance and risk management** What legislation and who is accountable? Developing a safety policy, managing safety, how to carry out a risk assessment, permits to work, Practical guidelines to handling emergencies, Business continuity – FM's role; How to get started – plan, brief, consult, Understanding the building – structure, design constraints, Space – cost, open plan, storage, restaurants etc., and how to avoid the pain, Removal contracts – the pitfalls

**Suggested Readings:**

1. Prof. L. C. Jhamb: Facility Management, Everest Publishing House.
2. Upendra Kachru: Risk Management, Excel Books.
3. P. Sunderashan Gopalakrishnan: Handbook of Facility Management, PHI.
4. R. Mishra- facility and Risk Management, Excel Books
5. S. N. Chary – Facility Management in Agri Business, TMGH
6. K. Sridhara Bhat: Agribusiness and facilities management, Himalaya Publishing House



## **BBA (Agribusiness) 307: Summer Internship/Presentation**

**Max. Marks: 50**

**Internal marks: 50**

### **Guidelines:**

1. At the end of second semester examination, every student of BBA (Agribusiness) will undergo on-the-job practical training in any agribusiness enterprise for 4-6 weeks duration.
2. During the course of internship students are expected to work diligently and learn agribusiness manifestations on the job in their chosen/assigned domain. The student, after the completion of training will submit a report to the College/Institute in the third semester before September 30.
3. The report (based on training and the problem/project studied) prepared by the student will be termed as Internship/Training Report. The median size of Report ordinarily will be 80-100 typed pages in standard font size (12) on the A-4 size paper.
4. The report will have two certificates. One by the student and the other by the Reporting Officer of the organization where the student has undergone training certifying the originality of the report.
5. The report will be evaluated by a committee of three faculty members appointed by Director/Principal of the college by way of its presentation by students before the committee.

**BBA (Agribusiness) 401: Agribusiness Supply Chain Management****Max. Marks: 100****External Assessment: 80****Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness supply chain management.

**Course Contents: Integrated Agri Supply management:** Food supply chain networks, advantages: food supply chain members, Components, Agri marketing basics, marketing channel basics.

**Agri marketing:** Traditional Agri Marketing scene, coordinated supply chains, case studies, Agro marketing: India – Characteristics, rural sales of commodity, state marketing departments.

**Regulations of Agri markets:** Definition, State Marketing departments, objectives, history of regulations, progress and reforms.

**Supply chain in horticulture:** History of horticulture supply chain, domestic consumptions and export, case studies: Supply chain for some products.

**Supply chain management in Dairy and Poultry:** Procurement, collection and processing, marketing & distribution, threats and opportunities.

**Suggested Readings**

1. Agribusiness supply chain management. CRC Press. Chandrasekaran, N., & Raghuram, G. (2014).
2. Supply chain management: text and cases. Pearson Education India. Shah, J. (2009).
3. Supply Chain Management in Fisheries (2012), B S Viswanatha and R S Biradar and Ramachandra Bhatta
4. Supply Chain Management of Horticultural Products in Karnataka H.M. Chandrasekhar Lambert Academic publishing

**BBA (Agribusiness) 402:            Agribusiness Enterprise Resource Planning**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness ERP management.

**Course Contents: Agribusiness Enterprise: An Overview:**Business Functions and Business Processes, importance of Information: Characteristics of information; Types of information, Information System: Components of an information system; Different types of information systems; Management information system, Enterprise Resource Planning: Business modelling; Integrated data model

**ERP and Related Technologies:**Business Process Re-engineering, Management Information systems, Decision Support Systems, Executive Information Systems- Advantages of EIS; Disadvantages of EIS, Data Warehousing, Data Mining, On-Line Analytical Processing, Product Life Cycle Management, Supply Chain Management, ERP Security

**ERP Modules Structure:**Finance, Sales and Distribution, Manufacturing and Production Planning- Material and Capacity Planning; Shop Floor Control; Quality Management; JIT/Repetitive Manufacturing; Cost Management; Plant Maintenance- Preventive Maintenance Control; Equipment Tracking; Component Tracking; Plant Maintenance Calibration Tracking; Plant Maintenance Warranty Claims Tracking, Quality Management - Functions of Quality Management; CAQ and CIQ; Materials Management- Pre-purchasing; Purchasing; VendorEvaluation; InventoryManagementandInvoiceVerificationandMaterialInspection.

**ERP: An Inventory Management Perspective:**Role of ERP in Inventory Management: Features of ERP inventory management system; Benefits of ERP inventory management system; Importance of Web ERP in Inventory Management, ERP Inventory Management Module, Sub-Modules of the ERP Inventory Management Module, Installation of ERP Inventory Management System, Failure of ERP Inventory

**ERP Vendors, Consultants, andEmployees:** Vendors- Role of the Vendor; Consultants: Types of consultants; Role of a Consultant, Employees; Role of employees; Resistance by employees; Dealing with employee resistance, Role of Top Management, Role ofImplementation Partner

**SuggestedReadings:**

1. Enterprise resource planning. McGraw-Hill Education. Leon, A. (2014).
2. Enterprise resource planning. Pearson Education India. Bansal, V. (2012).
3. Enterprise and Entrepreneurship for Agri-Business Management and Planning-Prof Manas Mohan Adhikary

## **BBA (Agribusiness) 403: Agri Business Financing in India**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness financing in India.

**Course Contents: Agricultural Finance: Introduction,** Nature and scope, importance of agriculture finance. Source of capitals: Meaning and concept of agriculture credit, classification and forms of credit. Credit as a tool of economic development.

**Agricultural Financial Analysis:** Principles of Credit – 5Cs, 5Rs and 7Ps of Credit – Project Cycle and Management -Preparation of bankable projects / Farm creditproposals – Feasibility – Time value of money: Compounding and Discounting – Appraisal of farm credit proposals – Undiscounted and discounted measures – Repayment plans – Farm Financial Statements: Balance Sheet, Income Statement and Cash Flow statement.

**Financial Institutions:**Institutional Lending Agencies – Commercial banks: Nationalization, Agricultural Development Branches – Area Approach – Priority Sector Lending – Regional Rural Banks, Lead bank, Scale of finance – Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India – Microfinance and its role in poverty alleviation – Self-Help Groups – Non - Governmental Organizations – Rural credit policies followed by State and Central Government – Subsidized farm credit, Differential Interest Rate (DIR), Kisan Credit Card (KCC) Scheme, Farm Income support schemes/facilities.

**Agri Finance Proposals:**Preparation of different types of agricultural finance proposals: Crop loans, Livestock/Dairy development loans, Purchase of agricultural machineries etc. Study of documents required for various agricultural finance proposals.

Assessment of crop losses, Determination of compensation – Crop insurance: Schemes, Coverage, Advantages and Limitations in implementation – Estimation of crop yields – Livestock, insurance schemes – Agricultural Insurance Company of India Ltd (AIC): Objectives and functions.

### **Suggested Readings**

1. Obst, W. J., Graham, R., & Christie, G. (2007). *Financial management for agribusiness*. Landlinks Press.
2. Miller, C., & Jones, L. (2010). *Agricultural value chain finance: Tools and lessons*. Rugby, Reino Unido: Practical Action Publishing.
3. Mani, G., Joshi, P. K., & Ashok, M. V. (Eds.). (2018). *Financing agriculture value chains in India: challenges and opportunities*. Springer.

## **BBA (Agribusiness) 404: Agricultural Marketing**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness marketing in India.

**Course Contents: Introduction to Agriculture Marketing:** Role of Agriculture in Economic Development of India –Role of Government in Agricultural Development.

**Marketing of agricultural produce:** Marketing of agricultural produce - marketing structure - regulated and organized markets - cooperative marketing Functions– Advantages & Limitations of Organized retailing in Agri Inputs and Outputs.

**SCM In Agri Business:** SCM In Agri Business i.e. Cold Chains, Organized procurement & warehousing, Innovative Distribution Channels like ITC E-choupal, Godrej Adhar, HUL Shakti Legal and Regulatory framework of Agricultural Marketing, Key. Agricultural Marketing Organizations, Market Information, Marketing Extension.

**Exim of Agricultural Commodities:** Exim of Agricultural Commodities - Export potential for agri- products, Major of Government and Non-Govt. Agencies in the development of Rural and Agricultural, Sector Marketing Strategies for Seed; Fertilizers; Pesticides; Farm equipment.

### **Suggested Readings**

1. Agri-input Marketing in India FIRST EDITION
2. Pingali Venugopal - XLRI - Xavier School of Management,
3. Ram Kaundinya - Chairman, An Association of Biotech Led Enterprises Agriculture Group (ABLE- AG), Managing Director, Advanta India Ltd
4. *Agricultural Marketing In India, 4/E*. Oxford and IBH publishing. Acharya, S. S. (2004).
5. Prasad, J., & Prasad, A. (Eds.). (1995). Indian Agricultural Marketing: Emerging Trends & Perspectives.
6. Emerging Trends in Agricultural Marketing in India Ashok M.V.
7. Marketing Of Agricultural Products 9Th Edition by Richard L Kohls and Joseph N Uhl, Pearson

**BBA (Agribusiness) 405 Organization and Management of Farm Producing Organization (FPOs)**

**Max. Marks: 100**

**Internal Assessment: 20**

**External Evaluation : 80**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of organization, management and functioning of Farm Producing Organisations in India.

**Course Contents: Introduction to FPOs**

Scope of FPOs, Understanding the changes related to GoI policies related to FPOs; Understanding FPO Development Process; Economic and Social Impact of FPOs; Key characteristics of Farm Producing companies

**Supply Services**

Understanding Supply services, Procurement/Packaging, Marketing services, Insurance services, Technical services, Networking services for FPOs, Empanelment processes.

**Stages of FPO Development**

Importance of Diagnostic and Feasibility studies in FPO Management, Organizing and Formalising FPOs, Systems Development, Business Planning, Linkages with other Organizations, Monitoring and review

**Budgeting for FPOs**

Understanding key terms like LRP (Local Resource Persons), RG/ FPO mobilisation, FIGs etc; Understanding Financial targets, Cost analysis and rationalization, Monitoring and review essentials; FPO support systems; IRR computation. Government (policy and finance) support/incentives/promotion to the FPOs in India. Challenges to the FPOs operations and functions in India.

**BusinessPlan:**Case study-based Business plan preparation: Industry analysis; Marketing and Financial plan

**Suggested Readings:**

**Making Farmer Producer Organizations Achieve Viability: A Practical Guide**[Sanjiv Phansalkar](#) , [Avinash Paranjape](#) (NAFP)

**Management of Cooperatives and FPOs**, Das, Sargam, Gomase and Minal.

**Resource Book on Formation and Functioning of Farmer Producer Organisation (2016)**, 3<sup>rd</sup> edition, FPO hub, Action for Social advancement, Bhopal.

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness data analytics.

**Course Contents:** A brief overview of Descriptive Statistics, Probability Distributions, Inferential Statistics, inferential Statistics through hypothesis tests. Randomization Tests.

Regression/ANOVA (Analysis of Variance): Basic concepts and analysis of agribusiness decisions. Understanding Machine Learning: Introduction and Concepts, differentiating algorithmic and model-based frameworks and Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression and data Classification for agribusiness decisions.

Supervised Learning with Regression and Classification techniques -1 Bias-Variance Dichotomy, Model Validation Approaches Logistic Regression Linear Discriminant Analysis, Quadratic Discriminant Analysis Regression and Classification Trees. Support Vector Machines Supervised Learning with Regression and Classification techniques -2 Ensemble Methods: Random Forest.

An overview of Neural Networks and Deep learning, Unsupervised Learning and Challenges for Big Data Analytics /Clustering/Associative Rule Mining and the Challenges for big data analytics

Prescriptive analytics Creating data for analytics through designed Experiments Creating data for analytics through Active learning Creating data for analytics through Reinforcement learning.

**Suggested Readings:**

1. Albright, Business Analytics, Cengage
2. Anderson, Sweeney, Essentials of Business Analytics, Cengage
3. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Wiley, 2013.
4. James R Evans, "Business Analytics – Methods, Models and Decisions", Pearson 2013
5. Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: Springer, 2009.
6. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010

**BBA (Agribusiness) 407 – Professional Etiquettes and Practices**

**Max. Marks: 50**

**Internal Assessment: 50**

**Important Note:**

The students in this paper will be groomed and evaluated by teachers in the college/institute to improve their communication skills, body language and table manners for professional etiquettes and also be updated on the current practices in the context.



**BBA (Agribusiness) 408**

**Comprehensive Viva Voce**

**Max. Marks: 50**

**External Assessment: 50**

**BBA (Agribusiness) 501: Business Ethics and Governance****Max. Marks: 100****External Assessment: 80****Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of Agribusiness ethics and governance.

**Course Contents:** Importance and the Sources of Value Systems, Types, Values, Loyalty and Ethical Behaviour, Values across Cultures; Business Ethics – Nature, Characteristics and Needs, Ethical Practices in Management. Importance of Ethics & Moral standards; Ethics & Moral Decision Making, Ethical Principles in Business.

**The Ethical Value System**

Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics– Ethical Values in different Cultures, Culture and Individual Ethics.

**Law and Ethics**

Relationship between Law and Ethics, Other Bodies in enforcing Ethical Business Behaviour, Impact of Laws on Business Ethics; Social Responsibilities of Business –Environmental Protection, Fair Trade Practices, fulfilling all National obligations under various Laws, Safeguarding Health and well-being of Customers.

**Issues in Business Ethics and Corporate Governance**

Ethical Issues related to Advertisements and Technology Ethical Issues related to Advertisements, Ethical Dilemma, Gandhian Approach in Management & Trusteeship Gandhian approach in Management & Trusteeship: Concept, importance & relevance of Trusteeship principle in modern business, Balanced Global Environment Balanced global environment, Kyoto Protocol concern of global warming, judicious and sustained use of natural resources.

**Suggested Readings:**

1. *Manuel G Velasquez: Business ethics, Pearson*
2. *John R Boatright: Ethics and the conduct of business, Pearson*
3. *Daniel Albuquerque: Business ethics, oxford*
4. *Thomas Clarke: International Corporate Governance, Routledge*
5. *Bhatia, S.K.: Business ethics and corporate governance, Deep and Deep*
6. *Khanna S.S : Business ethics and corporate governance, S. Chand*

## **BBA (Agribusiness) 502: Strategic Agribusiness Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of strategic agribusiness management.

### **Course Contents: Strategy and the Quest for Competitive Advantage:**

Military origins of strategy – Evolution - Concept and Characteristics of strategic management – Defining strategy – Mintzerberg's 5Ps of strategy– Corporate, Business and Functional Levels of strategy - Strategic Management Process.Strategic Intent & Strategy Formulation: Vision, mission and purpose – Business definition, objectives and goals – Stakeholders in business and their roles in strategic management - Corporate Social Responsibility, Ethical and Social Considerations in Strategy Development.

### **Analyzing Company's External Environment:** Environmental appraisal

Scenario planning – Preparing an Environmental Threat and Opportunity Profile (ETOP) – Industry Analysis - Porter's Five Forces Model of competition.Corporate Portfolio Analysis: Business Portfolio Analysis - Synergy and Dysynergy - BCG Matrix – GE 9 Cell Model - Concept of Stretch, Leverage and fit. Generic Competitive Strategies: Cost Leadership, Differentiation, Focus. Grand Strategies: Stability, Growth (Diversification Strategies, Vertical Integration Strategies, Mergers, Acquisition & Takeover Strategies, Strategic Alliances & Collaborative Partnerships), Retrenchment, Outsourcing Strategies.

### **Tailoring strategy to fit specific industry:**

Life Cycle Analysis - Emerging, Growing, Mature & Declining Industries

New Business Models and strategies for Internet Economy: Shaping characteristics of E-Commerce environment – E-Commerce Business Model and Strategies – Internet Strategies for Traditional Business – Key success factors in E-Commerce – Virtual Value Chain.

Strategy implementation: Project implementation – Procedural implementation – Resource Allocation – Organization Structure – Matching structure and strategy

### **Suggested Readings:**

1. *Allen C. Amason, Andrew ward: Strategic management from theory to practice, Routledge*
2. *Azhar Kazmi Strategic Management & Business Policy, Tata McGraw – Hill, Third Edition.*
3. *M. V. Kulkarni Business Policy & Strategic Management, Everest Publishing House.*
4. *Saroj Datta, Jaico Strategic Management Publishing House.*
5. *Thomas L. Wheelen& J. David HungerConcepts in Strategic Management & Business Policy Toward Global Sustainability*

## **BBA (Agribusiness) 503: Agri Business Risk Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of agribusiness risk management.

**Course Contents: Concept of Risk:** Risk – meaning – Types of Risk, Managing Risk, Sources and Measurement of Risk, Risk Evaluation and Prediction, Disaster Risk Management, Risk Retention and Transfer.

**Insurance:** Nature of Insurance Contract, Principle of Utmost Good Faith, Insurable Interest, proximity cause Contribution and subrogation, Indemnity, Legal Aspects of Insurance Contract, Concept of Insurance, Need for Insurance, Globalization of Insurance Sector, Reinsurance, Co-insurance, Weather and Crop insurance.

**General Insurance:** Types of general insurance – Fire and Motor Insurance Health Insurance, Marine Insurance, Automobile Insurance – Burglary and personal accident Insurance in India, Urban-non- traditional Insurance Agri Insurance

**Farm Risk management:** Meaning and definition, objectives and scope. Basic economic Principles of Farm Management, types and systems of farming, cost and returns, farm planning and budgeting, risk and uncertainty

### **Suggested Readings**

1. *J. B. Hardaker, Jock R. Anderson, and R. B. M. Huirne: Coping with risk in agriculture: CABI Publising*
2. *Nigel Scot: Agribusiness and commodity risk: strategies and management, Risk books*
3. *Julia roc, agribusiness: an international perspective-1<sup>st</sup> edition, Routledge*
4. *David Kahan, managing risk in farming, food and agriculture organization of the United Nations, Rome*

## **BBA (Agribusiness) 504: Procurement, Storage and Distribution of Foodgrains in India**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of procurement, storage and distribution of foodgrains in India.

**Course Contents:** Brief overview of nature and scope of Foodgrain procurement in India, Decentralized procurement, Levy Systems, MSP

### **Sourcing and Supply**

Supplier selection, Stock: Operational and buffer, Targeted Public Distribution System (TPDS), OWS (Other Welfare Schemes), FCI

### **Storage Systems**

Role of FCI, Central Warehousing Corporation and State Warehousing Corporations; CAP management; Buffer systems; Impact of CPI Inflation; Government storage agencies; Modern Technology in food grain handling; Storage capacities (state based)

### **Transportation**

Scope of Transportation of foodgrains, Open sale marketing scheme; Export and import of foodgrains

### **Distribution Acts and GoI**

Essential Commodities ACT; National Food Security Act (NFS), Fair Average quality; GoI regulations

### **Suggested Readings:**

1. Clute, M., 2017, Food industry Quality Control Systems, Crc. Press, London.
2. Singh, D. and Singh, D., 2015, Food Processing and Preservation. Shree Publishers and Distributors, New Delhi
3. Earfy R. 1995. Guide to Quality Monogement Systems for Food Industries. Blackie.
4. Jefen P. t985. Introduction to Food Processing. Reston Publishing.
5. Potly VH & Mulky MJ. 1993. Food Processing. Oxford & IBH

## **BBA (Agribusiness) 505 Summer Internship/presentations**

**Max. Marks: 50**

**Internal Assessment: 50**

### **Guidelines:**

1. At the end of second semester examination, every student of BBA (Agribusiness) will undergo on-the-job practical training in any agribusiness enterprise for 4-6 weeks duration.
2. During the course of internship students are expected to work diligently and learn agribusiness manifestations on the job in their chosen/assigned domain. The student, after the completion of training will submit a report to the College/Institute in the third semester before September 30.
3. The report (based on training and the problem/project studied) prepared by the student will be termed as Internship/Training Report. The median size of Report ordinarily will be 80-100 typed pages in standard font size (12) on the A-4 size paper.
4. The report will have two certificates. One by the student and the other by the Reporting Officer of the organization where the student has undergone training certifying the originality of the report.
5. The report will be evaluated by a committee three faculty members appointed by Director/ Principal of the college by way of its presentation by students before the committee.

## **BBA (Agribusiness) 506: Organic Food Production Practices**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of organic food production management and practices in India.

**Course Contents: Overview Of** Impact of hi-tech agriculture on crop production and environment. Alternate agriculture, sustainable agriculture and sustainable livelihood.

### **Food Production process**

Organic farming-concept, definition, principles and components. Status of organic farming in India and in other countries. Organic certification system.

### **Organic production**

National programme on organic production in India. Organic livestock and crops. Organic horticulture. Conversion to organic production. Organic farming project development.

### **Distribution**

Marketing of organic produce. Agri entrepreneurship in organic agriculture. Economics, environmental feasibility and sustainability of organic production system. Bio village concept. Organic food industry and trade of organic products.

### **Suggested Readings:**

1. *Pingalivenugopal and ram kaundinya, Agri-input marketing in India, Sage Publications*  
*Sukhpal sing, Rural marketing: focus on agricultural inputs, vikas publishing*

## **BBA (agribusiness) 507: Fertilizer Technology and Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of fertilizer technology and management.

**Course Contents:Fertilizer development:** Concept, scope, need, resource availability; import and export avenues for fertilizer; types of fertilizers, grading and chemical constituents, role of fertilizers in agricultural production, production and consumption of fertilizer in India.

### **Component Analysis**

Raw material needed and principles of manufacturing of nitrogenous, phosphatic and potassic fertilizers, secondary nutrient sources and micronutrient formulations.

### **Production efficacy**

Production efficiency and capacity utilization; quality control and legal aspects- fertilizer control order.

### **Testing**

Testing facilities; constraints in fertilizer use and emerging scenario of fertilizer use; assessment of demand and supply of different fertilizers, fertilizer distribution, fertilizer storage. Field trials and demonstration, fertilizer pricing policy; scope of biofertilizer; environmental pollution due to fertilizer use.

### **Suggested Readings:**

1. *Brahma Mishra, fertilizer technology and Management, Wiley*
2. *Ranjan Kumar Basak, Fertilizers a Textbook, Kalyani publications*
3. *Rattan Lal, Soil and Fertilizers, Taylor and Francis*



## **BBA (Agribusiness) 508: Food Processing Technology and Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of food processing and technology management.

**Course Contents: Review of Agricultural Policies:** Importance of Agribusiness in Indian Economy New Agricultural Policies National Agril. Policy, National Seed Policy, National Price Policy, National Food Processing Policy, National Foreign Trade Policy, National Fishery Policy, National Food Security Policy, National Food & Biotech, National Transportation of Food, National Nutrient Based Subsidy

**Agricultural Policies:** Agro-based Industries: Importance of Agro based Industries, Need of Agro based Industries, Classification of Agro based Industries, Types of Agro based Industries- Sugar Mills, Cotton Ginning Mills, Dal Mills, Rice Mills, Poha Mills, Fruit Processing Industries etc. Institutional Arrangement, Ministry of Agriculture (GOI), Financial Institutions, NABARD, NCDC, NDDDB, NCUI, APEDA, ICAR, NAFED, FCI, CWC, NHM, CFTRI, EPO, Procedure to set up agro- based Industries Constraints, In establishing Agro based Industries, Agricultural Value Chain : Value Chain Concept.

A brief review of project formulation in various types of food industries—cereals and pulses, milk and dairy products, processing of fruits and vegetables, egg and poultry processing; agricultural equipments industry- their production, marketing and constraints; establishment of agricultural engineering enterprise (agro service centres, etc.) processing of fruits and vegetables, egg and poultry processing; agricultural equipments industry- their production, marketing and constraints; establishment of agricultural engineering enterprise (agro service centres, etc.)

### **Suggested readings**

1. *Food Processing Technology: Principles and Practice*, 2nd Ed. CRC Press, Boca Raton, FL, USA.
2. *G Subbulakshmi and shobha A Udipi, food processing and preservation*, New age International Publishers
3. *P.J. Fellows, Food Processing Technology principles and practices*, Elsevier

## **BBA (Agribusiness) 509: AgroChemicals and Technology Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course objective:** The objective of this course is to enable students to understand dynamics of agro-chemicals and technology management.

**Course Contents: Analysis of Agrochemicals:** Adopted techniques: Separation/gap analysis; polarometry, spectroscopy, radioactivity

### **Advances in Pest Control**

Entomology, Bioefficacy of some pesticides against major pest, Host Plant Resistance, Plant protection appliances

### **Life Sciences**

Determination of parathion residues in foodgrains / plant materials and vegetables.

Study of the plant diseases of the following crops, at least 1 or 2 of each crop- Rice, Sorghum, Bajara, Beans, Oilseeds & Cash-crops.

### **Technology in pest control**

Biocontrol in Agroecosystem through management & Entomophagous insects: Introduction Role and impact of predators, parasitoids Biological characteristics, Role and impact strategies of biological control, conservation and habitat management.

Microbial control of insect: Introduction, History principle groups of pathogen, *Bacillus thuringiensis*, fungi, viruses, protozoa, their mode of action and methods of applications. Light activated pesticides, Pro-pesticides, genetic control, and chemosterilants

### **Biotechnology approaches in pest management:**

Introduction, recent advance in use of fungi, viruses and Bt. Methodology in Biotechnology, somaclonal variability and genetic engineering, transgenic plants microbial origin & protease inhibitor.

### **Suggested Readings:**

1. Broadway AC & Broadway Arif A. 2003. *A Textbook of Agri-Business Management*, Kalyani
2. Reddy, S.R. *Principles of Agronomy*, Kalyani
3. *Handbook of Agriculture*, ICAR publications

**BBA (Agribusiness) 601: Agribusiness and International Trade****Max. Marks: 100****External Assessment: 80****Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** The objective of this course is to sensitize students to the various facets of international business management, its rule regulations, practices and to create an understanding of various policies and practices of International Agribusiness Management.

**Course Contents:** International trade – basic concepts, Importance of foreign trade for developing economy; absolute and comparative advantage, foreign trade of India. WTO and its implications for Indian economy in general and agriculture sector in particular. Trade related intellectual Property rights (TRIPS), TRIMS, quotas, anti-dumping duties, quantitative and qualitative restrictions, tariff and non-tariff measures, trade liberalization, subsidies, green and red boxes, issues for negotiations in future in WTO; Countervailing Duty Measures and carbon trade, SPS Agreement. Regional economic groupings: A brief overview.

Composition of India's foreign trade policy; India's balance of payments; inter regional Vs international trade; tariffs and trade control; exchange rate; the foreign trade multiplier. Export promotion institutions with special emphasis on EPCs and commodity boards, MPEDA, APEDA and service institutes.

Foreign demand, supply side analysis, opportunity cost, trade and factor prices, implications for developing countries, export procedures & documentations. international marketing - market entry methods, international product planning, pricing, promotion, distribution, problems of exporters, legal dimensions of international marketing.

**Suggested Readings:**

1. Anant, K., Sundaram and Stewart, B. J., 2010, The International Business: Text and cases, PHI.
2. Bhalla V. K., 1993, International Economy- Liberalisation Process. Anmol, New Delhi.
3. Cherunilam, F., 2010, International Business- Text and Cases. PHI.
4. Economic Survey of India (various issues), Ministry of Finance, GOI.
5. Eiteman, D. K. and Stopnehill, A. L., 1986, Multinational Business Finance. Addition Wesley, New York.
6. Paul, J., 2013, International Business. PHI.
7. Subba Rao, P., 2008, International Business Text and Cases. HPH.

## **BBA (Agribusiness) 602: Management of Agribusiness Cooperatives**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness cooperative organizations and their management.

**Course Contents:** Cooperative administration- a global perspective, ecology of cooperative administration, cooperative sector and economic development.

Cooperative management- nature, functions and purpose of cooperatives – procurement, storage, processing, marketing, process of cooperative formation, role of leadership in cooperative management.

The state and cooperative movement, effects of cooperative law in management, long range planning for cooperative expansion, policy making. Human resource management, placement and role of board of directors in cooperative management.

Overview of agribusiness cooperative – credit cooperatives, cooperative marketing, dairy cooperative; financing agribusiness cooperatives in India.

### **Suggested Readings:**

1. Akmat JS. 1978. New Dimensions of Cooperative Management. Himalaya Publ. House.
2. Ansari AA. 1990. Cooperative Management Patterns. Anmol Publ.
3. Sah AK. 1984. Professional Management for the Cooperatives. Vikas Publishing House.

**BBA (Agribusiness) 603: Agri Commodities Derivative Trading in India**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness derivative trading in India.

**Course Contents:** A brief history of Agri commodity derivative trading in India. Review of agri commodities trading: Derivative trading in agricommodities, market platforms for derivative trading, derivative trade settlement systems in agri derivative trading, Risk mitigation and hedging of agri commodities trading, Nature and types of agriderivative trading in India.

Price discovery and valuation of agricommodities: Valuation models, price volatilities and transmission of volatilities in future and spots markets in agricommodities derivative trading. Trading strategies.

A brief review of India agriculture commodities derivative trading infrastructure; trade settlement guarantee, trading and transaction costs, warehousing infrastructure, trading liquidity and delivery, Quality sensitivities and commodities grading, transportation costs and commodities price spreads.

A critical review of Agricommodities derivative trading market regulations and guidelines in India.

**Suggested Readings:**

- 1 Commodities and Commodity **Derivatives**: Modeling and Pricing for Agriculturals, Metals and Energy: (The Wiley Finance Series), HelyetteGeman.
- 2 **Derivatives** :Somanathan, T. V., Nageswaran, V. Anantha, Gupta, Harsh, ReproIndia
- 3 Options, Futures, and Other **Derivatives**, Global Edition BY John Hull
- 4 Bomin, C. A., 1990, Agricultural Options: Trading, Risk Management and Hedging. Wiley Publ.
- 5 Gupta, S.L., 2005, Financial Derivatives. PHI.
- 6 Sridhar, A. N., 2008, Future and Options. Shroff Publishers and Distributors Pvt. Ltd.

**BBA (Agribusiness) 604: Agribusiness Entrepreneurship**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness entrepreneurship in India.

**Course Contents:** Entrepreneurship and Intrapreneurship—similarities and variance—India's agribusiness start ups in recent times—Trends, Imperatives, benefits; the players involved in the ecosystem, Business Incubators, Rural entrepreneurship, social entrepreneurship, women entrepreneurs—

The entrepreneurial mind-set—Key attributes of an agribusiness entrepreneur —Desirable and acquirable attitudes and behaviors—Readiness—The right time, right conditions—Myths and realities of entrepreneurship—Transition from college/ regular job to agribusiness entrepreneurship.

Agribusiness Entrepreneurial Stress— Composition—complementarity—Different life stages—Relative importance— Disagreements— Idea, opportunity and retrospective determinism—Creating and appropriating value— Scarcity, choice and trade offs— Identifying 'paying customer', developing market understanding— Narrowing focus—End user profiling.

Agribusiness Ideal Persona—Market segmentation, Market sizing— Marketing plan, pricing—Strategy—Rigor of another kind: Heuristics and Gut-feel— Agribusiness Business Plan preparation and execution.

Digital Economy as a resource— Promotion tools—the value of Likes and Shares— Matchmakers—Long Tail markets—Micro—Apps—Funding and agribusiness Incubation.

**Suggested Readings:**

1. Kumar, Arya (2012); Entrepreneurship, Pearson, New Delhi.
2. Greene, Cynthia L (2006), Entrepreneurship, Cengage Learning, New Delhi
3. Timmons, Jeffry A and Spinelli, Stephen (2007), New Venture Creation, McGrawHill, seventh edition, New Delhi
4. Shukla, MB, (2011), Entrepreneurship and Small Business Management, Kitab Mahal, Allahabad
5. Zenas Block and Ian C Macmillan, Corporate Venturing, Harvard Business School Press, Boston
6. Bamford, Entrepreneurship: A Small Business Approach 1st edn., McGraw Hill Education.

**BBA (Agribusiness) 605: Research Project\***

**Max. Marks: 50**

**External Assessment: 50**

**BBA (Agribusiness) 606: Comprehensive Viva- Voce**

**Max. Marks: 50**

**External Assessment: 50**



## **BBAgri 607: Decision-Making in Agri-Food System**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness decision making.

**Course Contents:** A brief review of attributes of a “good decision, its rationality and sustainability, **Perspectives of decision making:** Inferences and implications about how consumers make decisions, Rural consumer decision making, decisions to determine crop cycles, Consumer Decision Processes - High and Low Involvement, Pre- purchase Processes, Purchase, Post Purchase processes, Consumption and evaluation, Brand Loyalty and Repeat Purchase Behaviour.

**Contexts for thinking about decisions:** Prospective vs. Retrospective, Individual vs. group decisions, Advising vs. making decisions, Personal vs. business vs. government contexts, farm management decisions; farm management problems, establishing correct decisions.

**Self- awareness:** Does self-awareness help or hurt decision-making, How does knowing yourself help in making decisions about moving or a career change; in hiring someone? Management strategy to counteract uncertainty and decision making process in farm business management under risks and uncertainty.

Work performance efficiency, public contact and public participation in agro-processing industries. Decision making process and entrepreneurial efficiency. Government policies relating to agro-processing unit. Interdependence of agro-processing industries, Problem of agro-processing units. Guideline for financing of agro-processing industries in India.

### **Suggested Readings:**

1. Cook TM & Russell RA. 1989. Introduction to Management Science. Prentice Hall.
2. Taha HA. 2005. Operations Research - An Introduction. Prentice Hall.
3. Wagner HM. 2005. Principles of Operation Research. Prentice Hall.

## **BBA (Agribusiness) 608: Agricultural Bio-waste Management**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness decision making.

**Course Contents:** A brief review of agricultural and plant waste, agri waste disposal and recycling, stubble burning environmental pollution in Northern India, A brief history of plant tissue culture and plant genetic engineering, Scope and importance in crop improvement, factors affecting in-vitro culture techniques, applications and achievements, Somaclonal variations, types, reasons: Somatic embryogenesis and synthetic seed production technology, somatic hybridisation and its applications in crop improvement.

Industrial Fermenters, Single-cell Protein, Microorganisms in Agricultural Waste water treatment, Vermiculture, Microbial pesticides.

Food Cropping System: Interaction- competitive allelopathy legume effect, effect of preceding crop and associated crops. Indices for evaluation of cropping systems. Agronomic requirements in management of cropping system. Cropping scheme, calendar of operations, preparation of cropping scheme for wet garden and dry lands.

Sustainable agriculture: Introduction, definition, goal and current concepts, sustainable yield index and sustainable value index. Recycling of organic waste, management practices to prevent environmental deterioration, concept of sustainable agriculture. Resource management under constraint situations.

### **Suggested Readings:**

1. Raymond C Loehr, Agricultural Waste Management- problems, processes and approaches. First edition, Academic press, 1974.
2. Diaz, I.F., M. de Bertoldi and W. Bidlingmaier. 2007. Compost science and technology, Elsevier pub., PP.1-380.
3. Uta Krogmann, Ina Korne and Luis F. Diaz. 2010. Solid waste technology and management (Vol 1 and 2). Blackwell Pub Ltd., Wiley Online library.
4. Yong Sik Ok, Sophie M. Uchimiya, Scott X. Chang, Nanthi Bolan., Biochar-production characterization and applications. 2015. CRC press

## **BBAgri 609: Agribusiness Leadership in India**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness decision making

### **Course Contents:**

**Agribusiness Leadership :** An Overview- Characteristics and Styles,; Skills and Attributes for effective Leadership; Skills for Building Personal Credibility and Influencing others;

**Group, Teams and their Leadership :** Skills for Optimising Leadership as Situation Change ; Leadership and Change ; Communication and leadership; Management VS Leadership; Farm Leadership- Practices and Community Leadership in agrarian societies, leadership Challenges and Sustainability;

**Successful and Effective Leadership :** Qualities of Successful Leaders in agribusiness domain, grower, producers and processing; The Marketing Manifestations and Dispositions of agribusiness leadership ;

**Agribusiness Leadership :** A brief review of Agribusiness Leadership of ITC, IFFCO, HAFED, Amul, Reliance Fresh, Adani Agro, and FPOs in agribusiness leadership ; A Critique of Activist Leadership in agribusinesses ; Agribusiness Leadership Experiences through Journalism.

### **Suggested Reading:**

1. Fred Luthans 1998. Organizational Behavior. Tata McGraw Hill"
2. John w Newstrom & Keith Davis. 1997. Human Behaviour at Work, McGraw Hill.
3. Robert c Appleby. 1997. Modern Business Administration. Macmillan India.
4. Stephen P Robbins 2007. Organizational Behaviour. Prentice Hall.
5. The Economic and Political Weekly and the Economic Times, periodical and newspaper.

**BBA (Agribusiness) 610: Agri Inputs Marketing**

**Max. Marks: 100**

**External Assessment: 80**

**Internal Assessment: 20**

**Note:** The examiner will set eight questions in all. Question No. 1 comprising of five short answer type questions of 4 marks each will be compulsory. From the remaining questions, a student is required to attempt any four questions of 15 marks each.

**Course Objective:** To provide the students an understanding about the agribusiness inputs marketing in India.

**Agricultural input marketing** – meaning and importance; Management of distribution channels for agricultural input marketing; Agricultural Inputs and their types – farm and non-farm, role of cooperative, public and private sectors in agri input marketing.

**Seed-** Importance of seed input; Types of seeds- hybrid, high yielding and quality seeds; Seed marketing channels, pricing, export-import of seeds; Role of NSC and State Seed Corporation.

**Chemical Fertilizers-** Production, export-import, supply of chemical fertilizers, Demand/consumption, Prices and pricing policy; subsidy on fertilizers; marketing system – marketing channels, problems in distribution; Role of IFFCO and KRIBCO in fertilizer marketing.

**Plant Protection Chemicals-** Production, export/import, consumption, marketing system – marketing channels; Electricity/Diesel Oil- marketing and distribution system; pricing of electricity for agriculture use; subsidy on electricity.

**Farm Machinery-** Production, supply, demand, Marketing and distribution channels of farm machines; Agro-industries Corporation and marketing of farm machines / implements/Equipment.

**Suggested Readings:**

1. Acharya SS & Agarwal NL. 2004. *Agricultural Marketing in India*. 4th Ed. Oxford & IBH.
2. Broadway AC & Broadway Arif A. 2003. *A Text Book of Agri-Business, Management*. Kalyani.
3. Singh AK & Pandey S. 2005. *Rural Marketing*. New Age.
4. Singh Sukhpal 2004. *Rural Marketing- Focus on Agricultural Inputs*. Vikas Publishing House.

\*\*\*\*\*

## **Program Outcomes for the Faculty of Commerce and Management**

- PO1** Soft Skills and Working Skills: To comprehend, communicate and execute effectively and efficiently in all of their dealings
- PO2** Leadership: To develop abilities to both lead and respect the views, positions and beliefs of others and to plan and manage effectively.
- PO3** Innovativeness and Entrepreneurship: To explore issues and problems that needs solutions with entrepreneurial orientation.
- PO4** Ethics and Values: To recognize, appreciate and follow ethical standards in all walks of life.
- PO5** Adaptability and Sociability: Ready to understand and adapt the changing environment.
- PO6** Research and Analytical abilities: To explore, analyses and provide solutions on emerging issues concerning various fields including public policy.
- PO7** Practical exposure and Employability: Exposure to actual working environment leading to employability.
- PO8** Environmental Consciousness: In every action, dealing, service and manifestation.

### **Program Specific Outcomes (PSOs) for M.Com. (CBCS):**

- To equip the students with the ability to analyse business environment, identify business opportunities and understand the operation of commercial activities.
- To develop the analytical abilities, managerial skills and capabilities for business decision making.
- To nurture the research aptitude and use the same for solving business problems in paradigm of business ethics and social responsibility.
- The inculcate the entrepreneurial capabilities and enhance employability.

**Table 2: CO-PO matrix for the course M.COM. 101(Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 101.1	3	3	3	3	3	3	3	3
M.COM. 101.2	3	3	3	3	3	3	3	3
M.COM. 101.3	3	3	3	3	3	3	3	3
M.COM. 101.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the courseM.COM. 101 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 101.1	3	3	3	3
M.COM. 101.2	3	3	3	3
M.COM. 101.3	3	3	3	3
M.COM. 101.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 102 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 102.1	2	3	3	3	3	3	3	3
M.COM. 102.2	3	3	3	3	3	3	3	3
M.COM. 102.3	3	3	3	3	3	3	3	3
M.COM. 102.4	3	3	3	3	3	3	3	3
Average	2.75	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 102 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 102.1	3	3	3	3
M.COM. 102.2	3	3	3	3
M.COM. 102.3	3	3	3	3
M.COM. 102.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 103 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 103.1	3	3	3	3	3	3	3	3
M.COM. 103.2	2	2	3	3	3	3	2	3
M.COM. 103.3	2	3	3	3	3	3	3	3
M.COM. 103.4	3	3	3	3	3	3	3	3
Average	2.5	2.75	3	3	3	3	2.75	3

**Table 3: CO-PSO matrix for the course M.COM. 103 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 103.1	3	3	3	3
M.COM. 103.2	3	3	3	3
M.COM. 103.3	3	3	3	3
M.COM. 103.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 104 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 104.1	2	3	3	3	3	3	2	3
M.COM. 104.2	3	3	3	3	3	3	3	3
M.COM. 104.3	2	3	3	3	3	3	3	3
M.COM. 104.4	3	3	3	3	3	3	3	3
Average	2.5	3	3	3	3	3	2.75	3

**Table 3: CO-PSO matrix for the course M.COM. 104 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 104.1	3	3	3	3
M.COM. 104.2	3	3	3	3
M.COM. 104.3	3	3	3	2
M.COM. 104.4	3	3	3	3
Average	3	3	3	2.75

**Table 2: CO-PO matrix for the course M.COM. 105 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 105.1	3	3	3	3	3	3	3	3
M.COM. 105.2	3	3	3	3	3	3	3	3
M.COM. 105.3	3	3	3	3	3	3	3	3
M.COM. 105.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 105 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 105.1	3	3	3	3
M.COM. 105.2	3	3	3	3
M.COM. 105.3	3	3	3	3
M.COM. 105.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 106 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 106.1	3	3	3	3	3	3	3	3
M.COM. 106.2	3	3	3	3	3	3	3	3
M.COM. 106.3	3	3	3	3	3	3	3	3
M.COM. 106.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 106(Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 106.1	3	3	3	3
M.COM. 106.2	3	3	3	3
M.COM. 106.3	3	3	3	3
M.COM. 106.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 201 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 201.1	3	3	3	3	3	3	3	3
M.COM. 201.2	3	3	3	3	3	3	3	3
M.COM. 201.3	3	3	3	3	3	3	3	2
M.COM. 201.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	2.75

**Table 3: CO-PSO matrix for the course M.COM.201 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 201.1	3	3	3	3
M.COM. 201.2	3	3	3	3
M.COM. 201.3	3	3	3	3
M.COM. 201.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 202 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 202.1	3	3	3	3	3	3	3	3
M.COM. 202.2	3	3	3	3	3	3	3	3
M.COM. 202.3	3	3	3	3	3	3	3	3
M.COM. 202.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 202 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 202.1	3	3	3	3
M.COM. 202.2	3	3	3	3
M.COM. 202.3	3	3	3	3
M.COM. 202.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 203 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 203.1	3	3	3	3	3	3	3	3
M.COM. 203.2	3	3	3	3	3	3	3	3
M.COM. 203.3	3	3	3	3	3	3	3	3
M.COM. 203.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 203 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 203.1	3	3	3	3
M.COM. 203.2	3	3	3	3
M.COM. 203.3	3	3	3	3
M.COM. 203.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 204 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 204.1	3	3	3	3	3	3	3	3
M.COM. 204.2	3	3	3	3	3	3	3	3
M.COM. 204.3	3	3	3	3	3	3	3	3
M.COM. 204.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 204 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 204.1	3	3	3	3
M.COM. 204.2	3	3	3	3
M.COM. 204.3	3	3	3	3
M.COM. 204.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 205 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 205.1	3	3	3	3	3	3	3	2
M.COM. 205.2	3	3	3	3	3	3	3	3
M.COM. 205.3	3	3	3	3	3	3	3	2
M.COM. 205.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	2.5

**Table 3: CO-PSO matrix for the course M.COM. 205 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 205.1	3	3	3	3
M.COM. 205.2	3	3	3	3
M.COM. 205.3	3	3	3	3
M.COM. 205.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 206 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 206.1	3	3	3	3	3	3	3	2
M.COM. 206.2	3	3	3	3	3	3	3	2
M.COM. 206.3	3	3	3	3	3	3	3	2
M.COM. 206.4	3	3	3	3	3	3	3	2
Average	3	3	3	3	3	3	3	2

**Table 3: CO-PSO matrix for the course M.COM. 206 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 206.1	3	3	3	3
M.COM. 206.2	3	3	3	3
M.COM. 206.3	3	3	3	3
M.COM. 206.4	3	3	3	3
Average	3	3	3	3

**Table 4: CO-PO-PSO mapping matrix for all the courses of: (M.COM. CBCS)**

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
<b>M-COM 101</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 102</b>	2.75	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 103</b>	2.5	2.75	3	3	3	3	3	2.75	3	3	3	3
<b>M-COM 104</b>	2.5	3	3	3	3	3	3	2.75	3	3	3	2.75
<b>M-COM 105</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 106</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 201</b>	3	3	3	3	3	3	3	2.75	3	3	3	3
<b>M-COM 202</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 203</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 204</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 205</b>	3	3	3	3	3	3	3	2.5	3	3	3	3
<b>M-COM 206</b>	3	3	3	3	3	3	3	2	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 301 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 301.1	3	3	3	3	3	3	3	3
M.COM. 301.2	3	3	3	3	3	3	3	3
M.COM. 301.3	3	3	3	3	3	3	3	3
M.COM. 301.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 301 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 301.1	3	3	3	3
M.COM. 301.2	3	3	3	3
M.COM. 301.3	3	3	3	3
M.COM. 301.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 302 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 302.1	3	3	3	3	3	3	3	2
M.COM. 302.2	3	3	3	3	3	3	3	2
M.COM. 302.3	3	3	3	3	3	3	3	3
M.COM. 302.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	2.5

**Table 3: CO-PSO matrix for the course M.COM. 302 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 302.1	3	3	3	3
M.COM. 302.2	3	3	3	3
M.COM. 302.3	3	3	3	3
M.COM. 302.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 303 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 303.1	3	3	3	3	3	3	3	3
M.COM. 303.2	3	3	3	3	3	3	3	3
M.COM. 303.3	3	3	3	3	3	3	3	3
M.COM. 303.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 303 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 303.1	3	3	3	3
M.COM. 303.2	3	3	3	3
M.COM. 303.3	3	3	3	3
M.COM. 303.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 304 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 304.1	3	3	3	3	3	3	3	3
M.COM. 304.2	3	3	3	3	3	3	3	3
M.COM. 304.3	3	3	3	3	3	3	3	3
M.COM. 304.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 304 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 304.1	3	3	3	3
M.COM. 304.2	3	3	3	3
M.COM. 304.3	3	3	3	3
M.COM. 304.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 305 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 305.1	3	3	3	3	3	3	3	3
M.COM. 305.2	3	3	3	3	3	3	3	3
M.COM. 305.3	3	3	3	3	3	3	3	3
M.COM. 305.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 305 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 305.1	3	3	3	3
M.COM. 305.2	3	3	3	3
M.COM. 305.3	3	3	3	3
M.COM. 305.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 306 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 306.1	3	3	3	3	3	3	3	3
M.COM. 306.2	3	3	3	3	3	3	3	3
M.COM. 306.3	3	3	3	3	3	3	3	3
M.COM. 306.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 306 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 306.1	3	3	3	3
M.COM. 306.2	3	3	3	3
M.COM. 306.3	3	3	3	3
M.COM. 306.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 306 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 306.1	3	3	3	3	3	3	3	3
M.COM. 306.2	3	3	3	3	3	3	3	3
M.COM. 306.3	3	3	3	3	3	3	3	3
M.COM. 306.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 306 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 306.1	3	3	3	3
M.COM. 306.2	3	3	3	3
M.COM. 306.3	3	3	3	3
M.COM. 306.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 307 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 307.1	1	1	1	1	1	1	1	1
M.COM. 307.2	2	2	2	2	2	2	2	2
M.COM. 307.3	3	3	3	3	3	3	3	3
M.COM. 307.4	3	3	3	3	3	3	3	3
Average	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25

**Table 3: CO-PSO matrix for the course M.COM. 307 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 307.1	1	1	1	1
M.COM. 307.2	2	2	2	2
M.COM. 307.3	3	3	3	3
M.COM. 307.4	3	3	3	3
Average	2.25	2.25	2.25	2.25

**Table 2: CO-PO matrix for the course M.COM. 308 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 308.1	3	3	3	3	3	3	3	3
M.COM. 308.2	3	3	3	3	3	3	3	3
M.COM. 308.3	3	3	3	3	3	3	3	3
M.COM. 308.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 308 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 308.1	3	3	3	3
M.COM. 308.2	3	3	3	3
M.COM. 308.3	3	3	3	3
M.COM. 308.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 309 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 309.1	3	3	3	3	3	3	3	3
M.COM. 309.2	3	3	3	3	3	3	3	3
M.COM. 309.3	3	3	3	3	3	3	3	3
M.COM. 309.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 309 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 309.1	3	3	3	3
M.COM. 309.2	3	3	3	3
M.COM. 309.3	3	3	3	3
M.COM. 309.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 310 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 310.1	3	3	3	3	3	3	3	2
M.COM. 310.2	3	3	3	3	3	3	3	2
M.COM. 310.3	3	3	3	3	3	3	3	3
M.COM. 310.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	2.5

**Table 3: CO-PSO matrix for the course M.COM. 310 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 310.1	3	3	3	3
M.COM. 310.2	3	3	3	3
M.COM. 310.3	3	3	3	3
M.COM. 310.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 311 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 311.1	3	3	3	3	3	3	3	3
M.COM. 311.2	3	3	3	3	3	3	3	3
M.COM. 311.3	3	3	3	3	3	3	3	3
M.COM. 311.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 311 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 311.1	3	3	3	3
M.COM. 311.2	3	3	3	3
M.COM. 311.3	3	3	3	3
M.COM. 311.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 312 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 312.1	3	3	3	3	3	3	3	3
M.COM. 312.2	3	3	3	3	3	3	3	3
M.COM. 312.3	3	3	3	3	3	3	3	3
M.COM. 312.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 312 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 312.1	3	3	3	3
M.COM. 312.2	3	3	3	3
M.COM. 312.3	3	3	3	3
M.COM. 312.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 313 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 313.1	3	3	3	3	3	3	3	3
M.COM. 313.2	3	3	3	3	3	3	3	3
M.COM. 313.3	3	3	3	3	3	3	3	3
M.COM. 313.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 313 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 313.1	3	3	3	3
M.COM. 313.2	3	3	3	3
M.COM. 313.3	3	3	3	3
M.COM. 313.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 314 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 314.1	3	3	3	3	3	3	3	3
M.COM. 314.2	3	3	3	3	3	3	3	3
M.COM. 314.3	3	3	3	3	3	3	3	3
M.COM. 314.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 314 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 314.1	3	3	3	3
M.COM. 314.2	3	3	3	3
M.COM. 314.3	3	3	3	3
M.COM. 314.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 315 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 315.1	3	3	3	3	3	3	3	3
M.COM. 315.2	3	3	3	3	3	3	3	3
M.COM. 315.3	3	3	3	3	3	3	3	3
M.COM. 315.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 315 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 315.1	3	3	3	3
M.COM. 315.2	3	3	3	3
M.COM. 315.3	3	3	3	3
M.COM. 315.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 316 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 316.1	3	3	3	3	3	3	3	3
M.COM. 316.2	3	3	3	3	3	3	3	3
M.COM. 316.3	3	3	3	3	3	3	3	3
M.COM. 316.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 316 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 316.1	3	3	3	3
M.COM. 316.2	3	3	3	3
M.COM. 316.3	3	3	3	3
M.COM. 316.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 317 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 317.1	3	3	3	3	3	3	3	3
M.COM. 317.2	3	3	3	3	3	3	3	3
M.COM. 317.3	3	3	3	3	3	3	3	3
M.COM. 317.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 317(Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 317.1	3	3	3	3
M.COM. 317.2	3	3	3	3
M.COM. 317.3	3	3	3	3
M.COM. 317.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 318 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 318.1	3	3	3	3	3	3	3	3
M.COM. 318.2	3	3	3	3	3	3	3	3
M.COM. 318.3	3	3	3	3	3	3	3	3
M.COM. 318.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 318 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 318.1	3	3	3	3
M.COM. 318.2	3	3	3	3
M.COM. 318.3	3	3	3	3
M.COM. 318.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 319 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 319.1	3	3	3	3	3	3	3	3
M.COM. 319.2	3	3	3	3	3	3	3	2
M.COM. 319.3	3	3	3	3	3	3	3	3
M.COM. 319.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	2.75

**Table 3: CO-PSO matrix for the course M.COM. 319 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 319.1	3	3	3	3
M.COM. 319.2	3	3	3	3
M.COM. 319.3	3	3	3	3
M.COM. 319.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 401 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 401.1	3	3	3	3	3	3	3	3
M.COM. 401.2	3	3	3	3	3	3	3	3
M.COM. 401.3	3	3	3	3	3	3	3	3
M.COM. 401.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 401 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 401.1	3	3	3	3
M.COM. 401.2	3	3	3	3
M.COM. 401.3	3	3	3	3
M.COM. 401.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 402 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 402.1	3	3	3	3	3	3	3	3
M.COM. 402.2	3	3	3	3	3	3	3	3
M.COM. 402.3	3	3	3	3	3	3	3	3
M.COM. 402.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 402 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 402.1	3	3	3	3
M.COM. 402.2	3	3	3	3
M.COM. 402.3	3	3	3	3
M.COM. 402.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 403 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 403.1	3	3	3	3	3	3	3	3
M.COM. 403.2	3	3	3	3	3	3	3	3
M.COM. 403.3	3	3	3	3	3	3	3	3
M.COM. 403.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 403 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 403.1	3	3	3	3
M.COM. 403.2	3	3	3	3
M.COM. 403.3	3	3	3	3
M.COM. 403.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 404 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 404.1	3	3	3	3	3	3	3	3
M.COM. 404.2	3	3	3	3	3	3	3	3
M.COM. 404.3	3	3	3	3	3	3	3	3
M.COM. 404.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 404 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 404.1	3	3	3	3
M.COM. 404.2	3	3	3	3
M.COM. 404.3	3	3	3	3
M.COM. 404.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 405 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 405.1	3	3	3	3	3	3	3	3
M.COM. 405.2	3	3	3	3	3	3	3	3
M.COM. 405.3	3	3	3	3	3	3	3	3
M.COM. 405.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 405 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 405.1	3	3	3	3
M.COM. 405.2	3	3	3	3
M.COM. 405.3	3	3	3	3
M.COM. 405.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 406 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 406.1	3	3	3	3	3	3	3	3
M.COM. 406.2	3	3	3	3	3	3	3	3
M.COM. 406.3	3	3	3	3	3	3	3	3
M.COM. 406.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 406 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 406.1	3	3	3	3
M.COM. 406.2	3	3	3	3
M.COM. 406.3	3	3	3	3
M.COM. 406.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 407 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 407.1	3	3	3	3	3	3	3	3
M.COM. 407.2	3	3	3	3	3	3	3	3
M.COM. 407.3	3	3	3	3	3	3	3	3
M.COM. 407.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 407 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 407.1	3	3	3	3
M.COM. 407.2	3	3	3	3
M.COM. 407.3	3	3	3	3
M.COM. 407.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 408 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 408.1	3	3	3	3	3	3	3	3
M.COM. 408.2	3	3	3	3	3	3	3	3
M.COM. 408.3	3	3	3	3	3	3	3	3
M.COM. 408.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 408 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 408.1	3	3	3	3
M.COM. 408.2	3	3	3	3
M.COM. 408.3	3	3	3	3
M.COM. 408.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 409 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 409.1	3	3	3	3	3	3	3	3
M.COM. 409.2	3	3	3	3	3	3	3	3
M.COM. 409.3	3	3	3	3	3	3	3	3
M.COM. 409.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 409 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 409.1	3	3	3	3
M.COM. 409.2	3	3	3	3
M.COM. 409.3	3	3	3	3
M.COM. 409.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 410 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 410.1	3	3	3	3	3	3	3	3
M.COM. 410.2	3	3	3	3	3	3	3	3
M.COM. 410.3	3	3	3	3	3	3	3	3
M.COM. 410.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 410 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 410.1	3	3	3	3
M.COM. 410.2	3	3	3	3
M.COM. 410.3	3	3	3	3
M.COM. 410.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 411 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 411.1	3	3	3	3	3	3	3	3
M.COM. 411.2	3	3	3	3	3	3	3	3
M.COM. 411.3	3	3	3	3	3	3	3	3
M.COM. 411.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 411 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 411.1	3	3	3	3
M.COM. 411.2	3	3	3	3
M.COM. 411.3	3	3	3	3
M.COM. 411.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 412 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 412.1	3	3	3	3	3	3	3	3
M.COM. 412.2	3	3	3	3	3	3	3	3
M.COM. 412.3	3	3	3	3	3	3	3	3
M.COM. 412.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 412 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 412.1	3	3	3	3
M.COM. 412.2	3	3	3	3
M.COM. 412.3	3	3	3	3
M.COM. 412.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 413 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 413.1	3	3	3	3	3	3	3	2
M.COM. 413.2	3	3	3	3	3	3	3	2
M.COM. 413.3	3	3	3	3	3	3	3	2
M.COM. 413.4	3	3	3	3	3	3	3	2
Average	3	3	3	3	3	3	3	2

**Table 3: CO-PSO matrix for the course M.COM. 413 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 413.1	3	3	3	3
M.COM. 413.2	3	3	3	3
M.COM. 413.3	3	3	3	3
M.COM. 413.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 414 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 414.1	3	3	3	3	3	3	3	3
M.COM. 414.2	3	3	3	3	3	3	3	3
M.COM. 414.3	3	3	3	3	3	3	3	3
M.COM. 414.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 414 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 414.1	3	3	3	3
M.COM. 414.2	3	3	3	3
M.COM. 414.3	3	3	3	3
M.COM. 414.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 415 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 415.1	3	3	3	3	3	3	3	3
M.COM. 415.2	3	3	3	3	3	3	3	3
M.COM. 415.3	3	3	3	3	3	3	3	3
M.COM. 415.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 415 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 415.1	3	3	3	3
M.COM. 415.2	3	3	3	3
M.COM. 415.3	3	3	3	3
M.COM. 415.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 416 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 416.1	3	3	3	3	3	3	3	3
M.COM. 416.2	3	3	3	3	3	3	3	3
M.COM. 416.3	3	3	3	3	3	3	3	3
M.COM. 416.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 416 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 416.1	3	3	3	3
M.COM. 416.2	3	3	3	3
M.COM. 416.3	3	3	3	3
M.COM. 416.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 417 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 417.1	3	3	3	3	3	3	3	3
M.COM. 417.2	3	3	3	3	3	3	3	3
M.COM. 417.3	3	3	3	3	3	3	3	3
M.COM. 417.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 417 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 417.1	3	3	3	3
M.COM. 417.2	3	3	3	3
M.COM. 417.3	3	3	3	3
M.COM. 417.4	3	3	3	3
Average	3	3	3	3

**Table 2: CO-PO matrix for the course M.COM. 418 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 418.1	3	3	3	3	3	3	3	3
M.COM. 418.2	3	3	3	3	3	3	3	3
M.COM. 418.3	3	3	3	3	3	3	3	3
M.COM. 418.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 418 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 418.1	3	3	3	3
M.COM. 418.2	3	3	3	3
M.COM. 418.3	3	3	3	3
M.COM. 418.4	3	3	3	3
Average	3	3	3	3



**Table 2: CO-PO matrix for the course M.COM. 419 (Name of the Course)**

COs#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
M.COM. 419.1	3	3	3	3	3	3	3	3
M.COM. 419.2	3	3	3	3	3	3	3	3
M.COM. 419.3	3	3	3	3	3	3	3	3
M.COM. 419.4	3	3	3	3	3	3	3	3
Average	3	3	3	3	3	3	3	3

**Table 3: CO-PSO matrix for the course M.COM. 419 (Name of the Course)**

	PSO1	PSO2	PSO3	PSO4
M.COM. 419.1	3	3	3	3
M.COM. 419.2	3	3	3	3
M.COM. 419.3	3	3	3	3
M.COM. 419.4	3	3	3	3
Average	3	3	3	3

**Table 4: CO-PO-PSO mapping matrix for all the courses of: (M.COM. CBCS)**

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
<b>M-COM 301</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 302</b>	3	3	3	3	3	3	3	2.5	3	3	3	3
<b>M-COM 303</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 304</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 305</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 306</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 307</b>	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
<b>M-COM 308</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 309</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 310</b>	3	3	3	3	3	3	3	2.5	3	3	3	3
<b>M-COM 311</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 312</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 313</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 314</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 315</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 316</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 317</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 318</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 319</b>	3	3	3	3	3	3	3	2.75	3	3	3	3

**Table 4: CO-PO-PSO mapping matrix for all the courses of: (M.COM. CBCS)**

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
<b>M-COM 401</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 402</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 403</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 404</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 405</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 406</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 407</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 408</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 409</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 410</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 411</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 412</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 413</b>	3	3	3	3	3	3	3	2	3	3	3	2
<b>M-COM 414</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 415</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 416</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 417</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 418</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 419</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>M-COM 420</b>	3	3	3	3	3	3	3	3	3	3	3	3

## MC 307

### ADVANCED TAX LAWS AND PRACTICE

Credit: 04

External Marks: 80

Internal Marks: 20

Total Marks: 100

Time : 3 Hours

**Note:** There will be eight (8) questions in all. The first question is compulsory and consists of six (6) short-questions having four (4) marks each. Answer to these questions should not exceed 150 words. The candidate will be required to attempt any four questions out of remaining seven (7) questions and each question carries fourteen (14) marks each. Duration of each paper will be three (3) hours.

#### Course Learning Outcomes

After studying this course, the student will be able to:

CO1: Know the basic concept of GST.

CO2: Understand the provisions of GST Act regarding levy and collection of GST.

CO3: Apply the provisions for computation of GST.

CO4: Understand the Central Excise Laws and Custom Laws.

#### Course Contents

Goods and Services Tax: Basic Concepts, Structure of GST, Exemptions from GST, Levy and Collection of GST, Time and Supply of Goods and Services, Input Tax Credit, Computation of GST Liability, GST Returns.

Central Excise Laws: Basis of chargeability of duties of central excise- classification and valuation of excisable goods, assessment procedure, recovery and refund of duties. Clearance of excisable goods, filing of returns; CENVAT.

Custom Laws: Types of Custom Duty, Levy of and exemption from custom duties, valuation and assessment of duties, recovery and refund of custom duties, Prohibited, specified and notified goods, special provisions & rules relating to baggage, Procedure for clearance of imported and exported duties.

#### REFERENCES

Singhania, Vinod K. Students Guide to GST & Custom Law, Taxmann, New Delhi

Sareen, V.K., Sharma, Ajay: *Indirect Taxes*, Kalyani Publishers, New Delhi.

Ahuja G.K. and Gupta, Ravi: *Systematic Approach to Income Tax and Central Sales Tax*, Bharat Law House, New Delhi.

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/504  
Dated. 10.09.2021

Proceedings

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/425, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Electronics & Communication Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.

After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.

2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.

List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.

3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.

List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.

4. Any other agenda with permission of the chair.


Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Dean, Engineering & Technology, KUK
2. Dr. C. C. Tripathi, Professor, ECE, UIET, KUK
3. Dr. Reeta Devi, Assistant Professor, ECE, UIET, KUK
4. Dr. Monish Gupta, Assistant Professor, ECE, UIET, KUK
5. Mr. Puneet Bansal, Assistant Professor, ECE, UIET, KUK
6. Dr. Nikhil Marriwala, Assistant Professor, ECE, UIET, KUK
7. Dr. Deepak Sood, Assistant Professor, ECE, UIET, KUK
8. Mr. Rahul Gupta, Assistant Professor, ECE, UIET, KUK
9. Ms. Shikha Bhardwaj, Assistant Professor, ECE, UIET, KUK
10. Ms. Shefali Dhingra, Assistant Professor, ECE, UIET, KUK
11. Prof. M M Sharma, MNIT, Jaipur (Couldn't attend)
12. Prof. M. V. Katikeyan, Deptt. of ECE, IIT, Roorkee (Couldn't attend)



13. Director, UIET, Panjab University, Chandigarh (Couldn't attend)
14. Mr. Rajinder Kumar Kaura, CMD, Bergen Technologies (Couldn't attend)
15. Dr. Satender Sharma, Associate Professor, IIT, Mandi (Couldn't attend)
16. Dr. R. S. Chauhan, Director, JMIETI, Radaur
17. Dr. Ruchira Aneja, Associate Professor, PIET, Samalkha, Panipat
18. Mr. Vikas Kumar, Assistant Professor, Galaxy Group of Institutions, Dinarpur
19. Mr. Saurabh Goyal, Assistant Professor, ICL Institute of Engg. & Technology, Sountli, Shahjampur, Ambala
20. Mrs. Shweta Sharma, Assistant Professor, HEC, Jagadhary
21. Mr. Amit Mehla, Assistant Professor, KITM, Karnal
22. Mrs. Swati Gupta, Associate Professor, PIET, Samalkha, Panipat
23. Dr. Rohan Gupta, Associate Professor, JMIT, Radaur

  
Chairman (BOS)



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

No. DET/21/505  
Dated. 10.07.2021

Proceedings

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/427, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Computer Science & Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.

After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.

2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.

List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.

3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.

List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.

4. To discuss and approve new course of B.Tech Artificial Intelligence (AI) and Data Science to be introduced w.e.f. the session 2021-22.

Approved the scheme (1<sup>st</sup>-8<sup>th</sup> semesters) and syllabus in phased manner (1<sup>st</sup> and 2<sup>nd</sup> semester) of new course of B.Tech Artificial Intelligence (AI) and Data Science to be introduced w.e.f. the session 2021-22 (**Annexure-IV**).

5. Any other agenda with permission of the chair.  
The draft scheme and syllabus of M.Tech in Robotics & Artificial Intelligence was discussed and approved w.e.f. the session 2021-22 after suggested modifications (**Annexure-IV**).


Meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Dr. Sanjeev Dhawan, Assistant Prof., CSE, UIET, KUK



3. Dr. Kulvinder Singh, Assistant Prof., CSE, UIET, KUK
4. Dr. Naresh Kumar, Assistant Prof., CSE, UIET, KUK
5. Dr. Chander Diwakar, Assistant Prof., CSE, UIET, KUK
6. Dr. Mayank Dave, Professor, Deptt. of CSE, NIT, Kurukshetra
7. Dr. A. K. Singh, Professor, Deptt. of CSE, NIT, Kurukshetra (Couldn't attend)
8. Prof. Devanand, Dean, School of Basic and Applied Sciences, Head, Deptt. of CS & IT, Central University of Jammu, Jammu (Couldn't attend)
9. Sh. Divya Sethi, Business Head, Bharti Airtel Ltd., Plot no. 16, Phase IV, Sector 20, Gurugram (Couldn't attend)
10. Dr. Awadhesh Kumar Singh, Professor, Deptt. of CSE, NIT, Kurukshetra
11. Dr. Ravi Kumar Sachdeva, Director, APIIT SD India, Near Toll Plaza, Panipat
12. Dr. Rajiv Arora, Associate Professor, PIET, Samalkha, Panipat
13. Mr. Tarun Kumar, Assistant Professor, Galaxy Group of Institutions, Dinarpur
14. Mrs. Upasna, Assistant Professor, JMIT, Radaur,
15. Mr. Ashish Vashisht Assistant Professor, TERII, Kurukshetra
16. Er. Pooja Saini, Assistant Professor, ACE, Mithapur, Ambala
17. Mr. Ravi Kumar, Assistant Professor, Galaxi Global Group of Institutions, Dinarpur

  
**Chairman (BOS)**





**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/513  
Dated 18.09.2021

**PROCEEDINGS OF THE BOS MEETING**

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/425, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Mechanical Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

**AGENDA:**

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.
2. To discuss and approve new course of B.Tech Automation and Robotics to be introduced w.e.f. session 2021-22.
3. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.
4. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.
5. Any other agenda with permission of the chair.

**DECISIONS TAKEN:**

The following members attended the BOS meeting and after due deliberation, recommended the following:

1. After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.
2. Approved the scheme (1<sup>st</sup> to 8<sup>th</sup> sem) and syllabus in phased manner (1<sup>st</sup> and 2<sup>nd</sup> Sem) of new course of B.Tech Automation and Robotics to be introduced from session 2021-22. (**Annexure- II**)
3. List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.
4. List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-IV**.
5. As approved in the previous meeting of BOS, the condition of one paper publication is again waived off in light of prevailing pandemic situation due to Covid 19 for M.Tech students of Batch 2019-21.
6. The draft scheme and syllabus of M.Tech in Manufacturing Technology was discussed and approved w.e.f. 2021-22 after suggested modifications. (**Annexure - V**)
7. Since there was no other agenda, meeting ended with vote of thanks to the chair.

The meeting ended with thanks to chair.

(On line)

Prof. P.C.  
Tiwari  
NIT  
Kurukshetra

Mr. Anil Tanwar  
Manager,  
Snap on Tools

Dr. Parinam  
Anuradha  
F/I, MED, UIET

Dr. Sanjay Rajal  
AP, MED, UIET

Mr. Upender  
Dhull  
AP, MED,  
UIET

Dr. Sunil  
Dhingra  
AP, MED,  
UIET

Dr. Sunil Nain  
AP, MED, UIET

Dr. Vishal  
Ahlawat  
AP, MED, UIET

Mr. Manjeet  
Bohat  
AP, MED, UIET

(ON LEAVE)

Chairman, Board of Studies

Endst. No. DET/21/\_\_\_\_\_ Dated \_\_\_\_\_

Copy of the above is forwarded to the following for information and necessary action:

1. All the above members of BOS
2. Controller of Examinations, KUK
3. Controller of Examinations, UIET, KUK
4. Deputy Registrar (Academic Branch), KUK
5. Deputy Registrar (Conduct Branch), Practical, KUK

Chairman, Board of Studies



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/S.06  
Dated. 18.09.2021

Proceedings


With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/428, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Biotechnology for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.  
After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.
2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.  
List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.
3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.  
List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.
4. Any other agenda with permission of the chair.  
Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Dr. Anita Punia, Assistant Prof., BT, UIET, KUK
3. Dr. Pranay Jain, Assistant Prof., BT, UIET, KUK
4. Dr. Deepak Malik, Assistant Prof., BT, UIET, KUK
5. Dr. Rajesh Kumar, Assistant Prof., BT, UIET, KUK
6. Dr. Amita Mittal, Assistant Prof., BT, UIET, KUK
7. Dr. Sunita Khatak, Assistant Prof., BT, UIET, KUK
8. Dr. Dinesh Kumar, Sr. Scientist, Division of Agronomy, Indian Agricultural Research Institute, Pusa Campus, New Delhi-110012
9. Dr. R S Sangwan, Director, NABI, Mohali
10. Prof. Neeraj Dilbaghi, Deptt. of Bio & Nano Technology, GJU&ST, Hisar
11. Sh. Nalini Kant, Founder and Managing Director, Advanced Micro Devices, Pvt. Ltd. Ambala (Couldn't attend)
12. Dr. Pooja Sharma, Scientist, CSIO, Chandigarh
13. Dr. Mukesh Kumar, Dean Academic Affairs & Sr. Assistant Professor, Deptt. of Biotechnology Engg., ACE, Ambala

  
Chairman (BOS)

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/507  
Dated 16.07.2021

Proceedings


With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/426, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Electrical Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.  
After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.
2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.  
List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.
3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.  
List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.
4. Any other agenda with permission of the chair.  
Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Mr. Ram Avatar, EE, UIET, KUK
3. Mr. Vijay Kumar Garg, EE, UIET, KUK
4. Mr. Lalit Nagpal, EE, UIET, KUK (Couldn't attend)
5. Dr. Dilbagh Singh, Professor, Deptt. of Instrumentation, NIT, Jalandhar
6. Dr. Yajvender Pal Verma, Assistant Professor, UIET, Panjab University, Chandigarh (Couldn't attend)
7. Dr. Satish Kumar, Sr. Principle Scientist, CSIO, Chandigarh
8. Dr. Sanjeev Kumar, Scientist, CSIO, Chandigarh
9. Dr. Rohtash Dhiman, Assistant Professor, Deptt. of Electrical Engg., DCRUST, Murthal
10. Dr. Nidhika Birla, Associate Professor, JMIT, Radaur (Couldn't attend)
11. Mr. Arun Kumar, Assistant Professor, Galaxi Group of Institutions, Dinarapur
12. Mr. Sangeet Bhagat, Assistant Professor, SKIET, Kurukshetra (Couldn't attend)
13. Mr. Sohan Lal, Assistant Professor, Management & Technology Institutions, Gorgarh, Indri, Karnal (Couldn't attend)
14. Mr. Raman Kumar, Assistant Professor, APIIT SD India, Near Toll Plaza, Panipat
15. Mr. Rakesh Kumar, Assistant Professor, TERII, Kurukshetra
16. Mr. Satish Kumar, Assistant Professor, TERII, Kurukshetra
17. Mrs. Rajni Gupta, Assistant Professor, KITM, Karnal (Couldn't attend)

  
Chairman (BOS)



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/538  
Dated 10.09.2021

Proceedings

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/422, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Electrical & Electronics Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.


Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.  
After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.
2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.  
List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.
3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.  
List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.
4. Any other agenda with permission of the chair.  
Discussed and approved the syllabus of ‘Engineering Mechanics’ to be included in scheme of studies of B.Tech first year for the students admitted under later entry as per **Annexure-IV**.

Meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Dr. C.C. Tripathi, Professor, ECE, UIET, KUK
3. Dr. Reeta Devi, Assistant Professor, ECE, UIET, KUK
4. Mr. Vijay Kumar Garg, EE, UIET, KUK
5. Dr. Nidhika Birla, Associate Professor, JMIT, Radaur (Couldn't attend)
6. Mr. Arun Kumar, Assistant Professor, Galaxi Group of Institutions, Dinarapur
7. Mr. Sangeet Bhagat, Assistant Professor, SKIET, Kurukshetra (Couldn't attend)
8. Mr. Sohan Lal, Assistant Professor, Management & Technology Institutions, Gorgarh, Indri, Karnal
9. Mr. Rameshwar Sharma, Assistant Professor, GRIMT, Yamunanagar (Couldn't attend)
10. Mr. Sukhmeet Singh, Assistant Professor, TERII, Kurukshetra
11. Mr. Rajesh Kumar, Assistant Professor, TERII, Kurukshetra
12. Mrs. Rajni Gupta, Assistant Professor, KITM, Karnal (Couldn't attend)
13. Prof. Dharmender Singh, ECE, IIT, Roorkee
14. Prof. Sathans Sihag, NIT, Kurukshetra

  
Chairman (BOS)

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/509  
Dated 20.07.2021

Proceedings

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/421, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Information Technology for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.

After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.

2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.

List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.

3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.

List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.

4. Any other agenda with permission of the chair.

Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Dr. Sanjeev Dhawan, Assistant Prof., CSE, UIET, KUK
3. Dr. Chander Diwakar, Assistant Professor, CSE, UIET, KUK
4. Mr. Tarun Kumar, Assistant Professor, Galaxi Global Group of Institutions, Dinaurpur
5. Mrs. Upasna, Assistant Professor, JMIETI, Radaur
6. Ms. Pinki Tanwar, Assistant Professor, JMIT, Radaur
7. Mr. Vikas Khatri, Assistant Professor, MVVEC, Near Gauri Shankar Mandir, Jaroda Gate, Jagadhary (Couldn't attend)
8. Mr. Anuj Mehta, Assistant Professor, SKIET, Kurukshetra (Couldn't attend)
9. Mr. Ashish Vashisht, Assistant Professor, TERII, Kurukshetra
10. Mr. Vikas Juneja, Associate Professor, JMIT, Radaur
11. Mr. Ravi Kumar, Assistant Professor, Galaxi Group of Institutions, Dinaurpur (Couldn't attend)
12. Prof. Mayank Dave, Professor, NIT, Kurukshetra (Couldn't attend)
13. Prof. Shailender Singh, Head, CSE, PEC Chandigarh (Couldn't attend)

Chairman (BOS)



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/431  
Dated 16.07.2021

Proceedings

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/431, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Textile Technology for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.

After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.

2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.

List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.

3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.


List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.

4. Any other agenda with permission of the chair.

Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Dr. Urmila, Assistant Prof., Chemistry, UIET, KUK
3. Dr. Rajesh Agnihotri, Assistant Prof., Chemistry, UIET, KUK
4. Mr. Rajat Kumar Baldua, Assistant Professor, PIET, Samalkha, Panipat
5. Ms. Sapana Kushwaha, Assistant Professor, PIET, Samalkha, Panipat
6. Ms. Astha, Assistant Professor, PIET, Samalkha, Panipat
7. Prof. S Dhamija, Deptt. of Textile Technology, Tils Bhiwani, Haryana
8. Prof. Ashwini Kumar Agrawal, Head Deptt. of Textile & Fiber Engineering, IIT, Delhi  
(Couldn't attend)

  
Chairman (BOS)

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET/21/511  
Dated 12.09.21.

Proceedings

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/420, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Mechatronics Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.

After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.

2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.

List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.

3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.

List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.

4. Any other agenda with permission of the chair.

Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Dr. Reeta Devi, Assistant Professor, ECE, UIET, KUK
3. Dr. Sunil Nain, Assistant Prof., ME, UIET, KUK
4. Mr. Sachin Jasuja, Assistant Professor, APIIT SD India Near Toll Plaza, Panipat
5. Mr. Harpal Singh Kalra, Assistant Professor, APIIT SD India Near Toll Plaza, Panipat
6. Prof. Puran Chandra Tiwari, ME Deptt., NIT, Kurukshetra (Couldn't attend)
7. Prof. Manu Sharma, ME Deptt., UIET, PU, Chandigarh (Couldn't attend)

  
Chairman (BOS)



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(\*A+\* Grade NAAC Accredited)

No. DET/21/S12  
Dated. 12.09.2021

Proceedings


With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/423, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Civil Engineering for affiliated colleges of the Kurukshetra University, Kurukshetra was held in blended mode on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

Agenda:

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.  
After detailed discussion/ deliberation, it was resolved that the MOOC courses offered by the SWAYAM portal may be offered to the students of the affiliated colleges of the University to opt as the elective courses for earning additional 18-20 credits by them to earn the degree of B-Tech (Hons.)/Minor Degree w.e.f. session 2021-22. Therefore, the nomenclature and scheme of such courses along with the rules-regulation for credit transfer is approved as attached at **Annexure-I**.
2. To approve external theory examiners for UG/PG courses of odd semester in session 2021-22.  
List of external theory examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-II**.
3. To approve external practical examiners for UG/PG courses of odd semester in session 2021-22.  
List of external practical examiners approved for UG/PG courses of odd semester in session 2021-22 is attached at **Annexure-III**.
4. Any other agenda with permission of the chair.  
Since there was no other agenda, meeting ended with vote of thanks to the chair.

Following members attended the meeting and agreed with decisions taken above:

1. Prof. (Dr.) C.C. Tripathi, Dean(Engineering & Technology), KUK
2. Mr. Upender Dhull, Assistant Prof., ME, UIET, KUK
3. Dr. Vishal Ahlawat, Assistant Prof., ME, UIET, KUK
4. Dr. R S Sharma, Director, GRIMT, Yamunanagar (Couldn't attend)
5. Mr. Gurcharan Singh, Assistant Professor, TERII, Kurukshetra
6. Mr. Gaurav Kumar, Assistant Professor, PIET, Samalkha, Panipat
7. Mr. Janmajay, Assistant Professor, KITM, Karnal (Couldn't attend)
8. Dr. Tanvi Singh, Assistant Professor, PIET, Smalkha, Panipat
9. Mr. Munish Jain, Assistant Professor, HEC, Jagadhary (Couldn't attend)
10. Mr. Bhupender Singh, Assistant Professor, PIET, Smalkha, Panipat
11. Prof. Baldev Setia, Deptt. of Civil Engg. NIT, Kurukshetra
12. Prof. Umesh Sharma, Deptt. of Civil Engg., PEC, Chandigarh (Couldn't attend)

  
Chairman (BOS)

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

No. DET 21/5)4  
Dated 1.8.21

**Sub: Proceedings of the meeting of Regular Committee of Board of Studies (BOS) in Aeronautical Engineering held on 24<sup>th</sup> July, 2021 at 10:00 am. in UIET, KUK**

With reference to letter DET No. 416, Dated 16.07.2021, and subsequent letter No. DET/21/425, Dated 20.07.2021, the meeting of Regular Committee of Board of Studies (BOS) in Aeronautical Engineering was held on 24<sup>th</sup> July, 2021 at 10:00 AM in UIET, KUK. Following agendas were discussed and approved in this meeting.

**Agenda:**

1. To approve the scheme and detailed syllabus of the elective courses in emerging areas to be introduced for earning additional 18-20 credits by the students to earn the degree of B-Tech (Hons.)/Minor Degree to be introduced w.e.f. session 2021-22.
2. To approve external theory examiners for UG courses of odd semester in session 2021-22.
3. To approve external practical examiners for UG courses of odd semester in session 2021-22.
4. Any other agenda with permission of the chair.

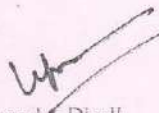
**DECISIONS TAKEN:**

The following members attended the BOS meeting and after due deliberation, recommended the following:

1. Approved the scheme of the elective courses of emerging areas in Aeronautical Engineering to be opted form SWAYAM courses for the award of B.Tech Honours Degree. (Annexure-I).
2. Approved the theory examiners for UG/PG (B. Tech/ M.Tech) courses for odd semester of session 2021-22. (Annexure-II).
3. Approved the practical examiners for UG/PG (B. Tech/ M.Tech) courses for odd semester of session 2021-22. (Annexure-III).

The meeting ended with thanks to chair.

  
Dr. Parinam Anuradha  
F/I MED, UIET, KUK


  
Mr. Upender Dhull  
AP, MED; UIET, KUK

  
Chairman (BOS)

Endst. No. DET/21/\_\_\_\_\_ Dated \_\_\_\_\_

Copy of the above is forwarded to the following for information and necessary action:

1. All the above members of BOS
2. Controller of Examinations, KUK
3. Controller of Examinations, UIET, KUK
4. Deputy Registrar (Academic Branch), KUK
5. Deputy Registrar (Conduct Branch), Practical, KUK

  
Chairman, Board of Studies  
KURUKSHETRA UNIVERSITY

**Nomenclature for B.Tech. Degree in Emerging Areas of  
Electronics and Communication Engineering**

1. B.Tech. (Hons.) Electronics and Communication Engineering with Specialization in Artificial Intelligence and Machine Learning
2. B.Tech. (Hons.) Electronics and Communication Engineering with Specialization in Internet of Things (IoT)
3. B.Tech. (Hons.) Electronics and Communication Engineering with Specialization in Blockchain
4. B.Tech. (Hons.) Electronics and Communication Engineering with Specialization in Robotics
5. B.Tech. (Hons.) Electronics and Communication Engineering with Specialization in Data Science
6. B.Tech. (Hons.) Electronics and Communication Engineering with Specialization in Cyber Security
7. B.Tech. Electronics and Communication Engineering with Minor Degree in 3D Printing
8. B.Tech. Electronics and Communication Engineering with Minor Degree in Electric Vehicles
9. B.Tech. Electronics and Communication Engineering with Minor Degree in Energy Engineering
10. B.Tech. Electronics and Communication Engineering with Minor Degree in Mechatronics
11. B.Tech. Electronics and Communication Engineering with Minor Degree in Computer Science and Biology
12. B.Tech. Electronics and Communication Engineering with Minor Degree in Drug Engineering
13. B.Tech. Electronics and Communication Engineering with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of**  
**Computer Science and Engineering**

1. B.Tech. (Hons.) Computer Science and Engineering with Specialization in Artificial Intelligence and Machine Learning
2. B.Tech. (Hons.) Computer Science and Engineering with Specialization in Blockchain
3. B.Tech. (Hons.) Computer Science and Engineering with Specialization in Data Science
4. B.Tech. (Hons.) Computer Science and Engineering with Specialization in Internet of Things (IoT)
5. B.Tech. (Hons.) Computer Science and Engineering with Specialization in Cyber Security
6. B.Tech. Computer Science and Engineering with Minor Degree in 3D Printing
7. B.Tech. Computer Science and Engineering with Minor Degree in Electric Vehicles
8. B.Tech. Computer Science and Engineering with Minor Degree in Energy Engineering
9. B.Tech. Computer Science and Engineering with Minor Degree in Robotics
10. B.Tech. Computer Science and Engineering with Minor Degree in Mechatronics
11. B.Tech. Computer Science and Engineering with Minor Degree in Computer Science and Biology
12. B.Tech. Computer Science and Engineering with Minor Degree in Drug Engineering
13. B.Tech. Computer Science and Engineering with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of  
Mechanical Engineering**

1. B.Tech. (Hons.) Mechanical Engineering with Specialization in 3D Printing
2. B.Tech. (Hons.) Mechanical Engineering with Specialization in Electric Vehicles
3. B.Tech. (Hons.) Mechanical Engineering with Specialization in Energy Engineering
4. B.Tech. (Hons.) Mechanical Engineering with Specialization in Robotics
5. B.Tech. (Hons.) Mechanical Engineering with Specialization in Mechatronics
6. B.Tech. Mechanical Engineering with Minor Degree in Artificial Intelligence and Machine Learning
7. B.Tech. Mechanical Engineering with Minor Degree in Blockchain
8. B.Tech. Mechanical Engineering with Minor Degree in Data Science
9. B.Tech. Mechanical Engineering with Minor Degree in Internet of Things (IoT)
10. B.Tech. Mechanical Engineering with Minor Degree in Cyber Security
11. B.Tech. Mechanical Engineering with Minor Degree in Computer Science and Biology
12. B.Tech. Mechanical Engineering with Minor Degree in Drug Engineering
13. B.Tech. Mechanical Engineering with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of  
Biotechnology**

1. B.Tech. (Hons.) Biotechnology with Specialization in Computer Science and Biology
2. B.Tech. (Hons.) Biotechnology with Specialization in Drug Engineering
3. B.Tech. (Hons.) Biotechnology with Specialization in Genome Engineering and Technology
4. B.Tech. Biotechnology with Minor Degree in Artificial Intelligence and Machine Learning
5. B.Tech. Biotechnology with Minor Degree in Blockchain
6. B.Tech. Biotechnology with Minor Degree in Data Science
7. B.Tech. Biotechnology with Minor Degree in Internet of Things (IoT)
8. B.Tech. Biotechnology with Minor Degree in Cyber Security
9. B.Tech. Biotechnology with Minor Degree in 3D Printing
10. B.Tech. Biotechnology with Minor Degree in Electric Vehicles
11. B.Tech. Biotechnology with Minor Degree in Energy Engineering
12. B.Tech. Biotechnology with Minor Degree in Mechatronics
13. B.Tech. Biotechnology with Minor Degree in Robotics

**Nomenclature for B.Tech. Degree in Emerging Areas of**  
**Electrical Engineering**

1. B.Tech. (Hons.) Electrical Engineering with Specialization in Internet of Things (IoT)
2. B.Tech. (Hons.) Electrical Engineering with Specialization in Robotics
3. B.Tech. (Hons.) Electrical Engineering with Specialization in Electric Vehicles
4. B.Tech. (Hons.) Electrical Engineering with Specialization in Energy Engineering
5. B.Tech. Electrical Engineering with Minor Degree in Mechatronics
6. B.Tech. Electrical Engineering with Minor Degree in Artificial Intelligence and Machine Learning
7. B.Tech. Electrical Engineering with Minor Degree in Blockchain
8. B.Tech. Electrical Engineering with Minor Degree in Data Science
9. B.Tech. Electrical Engineering with Minor Degree in Cyber Security
10. B.Tech. Electrical Engineering with Minor Degree in 3D Printing
11. B.Tech. Electrical Engineering with Minor Degree in Computer Science and Biology
12. B.Tech. Electrical Engineering with Minor Degree in Drug Engineering
13. B.Tech. Electrical Engineering with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of**  
**Electrical and Electronics Engineering**

1. B.Tech. (Hons.) Electrical and Electronics Engineering with Specialization in Internet of Things (IoT)
2. B.Tech. (Hons.) Electrical and Electronics Engineering with Specialization in Robotics
3. B.Tech. (Hons.) Electrical and Electronics Engineering with Specialization in Electric Vehicles
4. B.Tech. (Hons.) Electrical and Electronics Engineering with Specialization in Energy Engineering
5. B.Tech. (Hons.) Electrical and Electronics Engineering with Specialization in Mechatronics
6. B.Tech. Electrical and Electronics Engineering with Minor Degree in Artificial Intelligence and Machine Learning
7. B.Tech. Electrical and Electronics Engineering with Minor Degree in Blockchain
8. B.Tech. Electrical and Electronics Engineering with Minor Degree in Data Science
9. B.Tech. Electrical and Electronics Engineering with Minor Degree in Cyber Security
10. B.Tech. Electrical and Electronics Engineering with Minor Degree in 3D Printing
11. B.Tech. Electrical and Electronics Engineering with Minor Degree in Computer Science and Biology
12. B.Tech. Electrical and Electronics Engineering with Minor Degree in Drug Engineering
13. B.Tech. Electrical and Electronics Engineering with Minor Degree in Genome Engineering and Technology



**Nomenclature for B.Tech. Degree in Emerging Areas of  
Information Technology**

1. B.Tech. (Hons.) Information Technology with Specialization in Artificial Intelligence and Machine Learning
2. B.Tech. (Hons.) Information Technology with Specialization in Blockchain
3. B.Tech. (Hons.) Information Technology with Specialization in Data Science
4. B.Tech. (Hons.) Information Technology with Specialization in Internet of Things (IoT)
5. B.Tech. (Hons.) Information Technology with Specialization in Cyber Security
6. B.Tech. Information Technology with Minor Degree in 3D Printing
7. B.Tech. Information Technology with Minor Degree in Electric Vehicles
8. B.Tech. Information Technology with Minor Degree in Energy Engineering
9. B.Tech. Information Technology with Minor Degree in Robotics
10. B.Tech. Information Technology with Minor Degree in Mechatronics
11. B.Tech. Information Technology with Minor Degree in Computer Science and Biology
12. B.Tech. Information Technology with Minor Degree in Drug Engineering
13. B.Tech. Information Technology with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of  
Textile Technology**

1. B.Tech. (Hons.) Textile Technology with Specialization in Fashion Marketing and Merchandising
2. B.Tech. (Hons.) Textile Technology with Specialization in Technical Textile
3. B.Tech. Textile Technology with Minor Degree in Artificial Intelligence and Machine Learning
4. B.Tech. Textile Technology with Minor Degree in Blockchain
5. B.Tech. Textile Technology with Minor Degree in Data Science
6. B.Tech. Textile Technology with Minor Degree in Internet of Things (IoT)
7. B.Tech. Textile Technology with Minor Degree in Cyber Security
8. B.Tech. Textile Technology with Minor Degree in 3D Printing
9. B.Tech. Textile Technology with Minor Degree in Electric Vehicles
10. B.Tech. Textile Technology with Minor Degree in Energy Engineering
11. B.Tech. Textile Technology with Minor Degree in Robotics
12. B.Tech. Textile Technology with Minor Degree in Mechatronics
13. B.Tech. Textile Technology with Minor Degree in Computer Science and Biology
14. B.Tech. Textile Technology with Minor Degree in Drug Engineering
15. B.Tech. Textile Technology with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of**  
**Mechatronics Engineering**

1. B.Tech. (Hons.) Mechatronics Engineering with Specialization in Internet of Things (IoT)
2. B.Tech. (Hons.) Mechatronics Engineering with Specialization in Robotics
3. B.Tech. (Hons.) Mechatronics Engineering with Specialization in Electric Vehicles
4. B.Tech. (Hons.) Mechatronics Engineering with Specialization in Energy Engineering
5. B.Tech. Mechatronics Engineering with Minor Degree in Artificial Intelligence and Machine Learning
6. B.Tech. Mechatronics Engineering with Minor Degree in Blockchain
7. B.Tech. Mechatronics Engineering with Minor Degree in Data Science
8. B.Tech. Mechatronics Engineering with Minor Degree in Cyber Security
9. B.Tech. Mechatronics Engineering with Minor Degree in 3D Printing
10. B.Tech. Mechatronics Engineering with Minor Degree in Computer Science and Biology
11. B.Tech. Mechatronics Engineering with Minor Degree in Drug Engineering
12. B.Tech. Mechatronics Engineering with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of Civil Engineering**

1. B.Tech. (Hons.) Civil Engineering with Specialization in Smart Cities
2. B.Tech. (Hons.) Civil Engineering with Specialization in 3D Printing
3. B.Tech. Civil Engineering with Minor Degree in Electric Vehicles
4. B.Tech. Civil Engineering with Minor Degree in Energy Engineering
5. B.Tech. Civil Engineering with Minor Degree in Robotics
6. B.Tech. Civil Engineering with Minor Degree in Mechatronics
7. B.Tech. Civil Engineering with Minor Degree in Artificial Intelligence and Machine Learning
8. B.Tech. Civil Engineering with Minor Degree in Blockchain
9. B.Tech. Civil Engineering with Minor Degree in Data Science
10. B.Tech. Civil Engineering with Minor Degree in Internet of Things (IoT)
11. B.Tech. Civil Engineering with Minor Degree in Cyber Security
12. B.Tech. Civil Engineering with Minor Degree in Computer Science and Biology
13. B.Tech. Civil Engineering with Minor Degree in Drug Engineering
14. B.Tech. Civil Engineering with Minor Degree in Genome Engineering and Technology

**Nomenclature for B.Tech. Degree in Emerging Areas of  
Aeronautical Engineering**

1. B.Tech. (Hons.) Aeronautical Engineering with Specialization in Aerospace Propulsion
2. B.Tech. Aeronautical Engineering with Minor Degree in 3D Printing
3. B.Tech. Aeronautical Engineering with Minor Degree in Electric Vehicles
4. B.Tech. Aeronautical Engineering with Minor Degree in Energy Engineering
5. B.Tech. Aeronautical Engineering with Minor Degree in Robotics
6. B.Tech. Aeronautical Engineering with Minor Degree in Mechatronics
7. B.Tech. Aeronautical Engineering with Minor Degree in Artificial Intelligence and Machine Learning
8. B.Tech. Aeronautical Engineering with Minor Degree in Blockchain
9. B.Tech. Aeronautical Engineering with Minor Degree in Data Science
10. B.Tech. Aeronautical Engineering with Minor Degree in Internet of Things (IoT)
11. B.Tech. Aeronautical Engineering with Minor Degree in Cyber Security
12. B.Tech. Aeronautical Engineering with Minor Degree in Computer Science and Biology
13. B.Tech. Aeronautical Engineering with Minor Degree in Drug Engineering
14. B.Tech. Aeronautical Engineering with Minor Degree in Genome Engineering and Technology

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 1: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Artificial Intelligence and Machine Learning**

<b>Artificial Intelligence and Machine Learning</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/AI-1	Artificial Intelligence : Search Methods For Problem solving
	SPMDA/AI-2	<b>OR</b> An Introduction to Artificial Intelligence
2.	SPMDA/AI-3	Artificial Intelligence: Knowledge Representation and Reasoning
3.	SPMDA/AI-4	Programming, Data Structures and Algorithms in Python
	SPMDA/AI-5	<b>OR</b> Python for Data Science
4.	SPMDA/AI-6	Introduction to Machine Learning
5.	SPMDA/AI-7	Deep Learning
	SPMDA/AI-8	<b>OR</b> Deep Learning for Computer Vision
6.	SPMDA/AI-9	Reinforcement Learning
7.	SPMDA/AI-10	AI: Constraint Satisfaction
8.	SPMDA/AI-11	Computer Vision
9.	SPMDA/AI-12	Natural Language Processing
	SPMDA/AI-13	<b>OR</b> Applied Natural Language Processing
10.	SPMDA/AI-14	Practical Machine Learning with Tensorflow
11.	SPMDA/AI-15	Introduction to Data Analytics
	SPMDA/AI-16	<b>OR</b> Data Science for Engineers
12.	SPMDA/AI-17	Learning Analytics Tools
13.	SPMDA-1	Design Thinking - A Primer
14.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade NAAC Accredited)

**Table 2: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Internet of Things (IoT)**

<b>Internet of Things (IoT)</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
Sr. No.	Code	Subject Nomenclature
1.	SPMDA/IoT-1	Introduction to Industry 4.0 and Industrial Internet of Things
	SPMDA/IoT-2	<b>OR</b> Introduction to Internet of Things
2.	SPMDA/IoT-3	Electronic Systems for Sensor Applications
3.	SPMDA/IoT-4	Optical Fiber Sensors
	SPMDA/IoT-5	<b>OR</b> Optical Sensors
4.	SPMDA/IoT-6	Introduction to Machine Learning
5.	SPMDA/IoT-7	Selection of Nanomaterials for Energy Harvesting and Storage Application
6.	SPMDA/IoT-8	Python for Data Science
7.	SPMDA/IoT-9	Deep Learning
	SPMDA/IoT-10	<b>OR</b> Deep Learning for Computer Vision
8.	SPMDA/IoT-11	Reinforcement Learning
9.	SPMDA/IoT-12	Cloud computing
	SPMDA/IoT-13	<b>OR</b> Google Cloud Computing Foundations
10.	SPMDA/IoT-14	Modern Application Development
11.	SPMDA/IoT-15	Introduction to Data Analytics
	SPMDA/IoT-16	<b>OR</b> Data Science for Engineers
12.	SPMDA/IoT-17	Computer Networks and Internet Protocol
13.	SPMDA/IoT-18	Introduction to Database Systems
14.	SPMDA-1	Design Thinking – A Primer
15.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 3: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Blockchain**

<b>Blockchain</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/BL-1	Introduction to Blockchain Technology and Applications
	SPMDA/BL-2	<b>OR</b> Blockchain Architecture Design and Use Cases
2.	SPMDA/BL-3	Introduction to Internet of Things
3.	SPMDA/BL-4	Information Security – 5 – Secure Systems Engineering
4.	SPMDA/BL-5	Introduction to Machine Learning
5.	SPMDA/BL-6	Ethical Hacking
6.	SPMDA/BL-7	GPU Architectures and Programming
7.	SPMDA/BL-8	Computer Networks and Internet Protocol
8.	SPMDA/BL-9	Cloud computing
	SPMDA/BL-10	<b>OR</b> Google Cloud Computing Foundations
9.	SPMDA/BL-11	Foundations of Cryptography
10.	SPMDA/BL-12	Information Theory and Coding
11.	SPMDA/BL-13	Introduction to Database Systems
12.	SPMDA/BL-14	Internetwork Security
13.	SPMDA-1	Design Thinking – A Primer
14.	SPMDA-2	Ethics in Engineering Practice



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 4: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Robotics**

<b>Robotics</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/RB-1	Foundations of Cognitive Robotics
2.	SPMDA/RB-2	Introduction to Robotics
	SPMDA/RB-3	<b>OR</b> Robotics
3.	SPMDA/RB-4	Mechanism and Robot Kinematics
4.	SPMDA/RB-5	Computer Architecture and Organization
5.	SPMDA/RB-6	Power Electronics
6.	SPMDA/RB-7	Principle of Hydraulic Machines and System Design
7.	SPMDA/RB-8	Programming, Data Structures and Algorithms Using Python
8.	SPMDA/RB-9	Control Systems
9.	SPMDA/RB-10	Fundamentals of Artificial Intelligence
10.	SPMDA/RB-11	Introduction to Machine Learning
11.	SPMDA/RB-12	Dynamical System and Control
12.	SPMDA/RB-13	Introduction to Embedded System Design
13.	SPMDA/RB-14	Introduction to Internet of Things
	SPMDA/RB-15	<b>OR</b> Introduction to Industry 4.0 and Industrial Internet of Things
14.	SPMDA-1	Design Thinking – A Primer
15.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 5: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Data Science**

<b>Data Science</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/DS-1	Python for Data Science
	SPMDA/DS-2	<b>OR</b> Programming, Data Structures and Algorithms in Python
2.	SPMDA/DS-3	Introduction to Data Analytics
	SPMDA/DS-4	<b>OR</b> Data Science for Engineers
3.	SPMDA/DS-5	Programming, Data Structures and Algorithms in Python
	SPMDA/DS-6	<b>OR</b> Python for Data Science
4.	SPMDA/DS-7	Introduction to Machine Learning
5.	SPMDA/DS-8	Deep Learning
	SPMDA/DS-9	<b>OR</b> Deep Learning for Computer Vision
6.	SPMDA/DS-10	Reinforcement Learning
7.	SPMDA/DS-11	Artificial Intelligence : Search Methods For Problem solving
	SPMDA/DS-12	<b>OR</b> An Introduction to Artificial Intelligence
8.	SPMDA/DS-13	Artificial Intelligence: Knowledge Representation and Reasoning
9.	SPMDA/DS-14	Computer Vision
10.	SPMDA/DS-15	Natural Language Processing
	SPMDA/DS-16	<b>OR</b> Applied Natural Language Processing
11.	SPMDA/DS-17	Practical Machine Learning with Tensorflow
12.	SPMDA/DS-18	Learning Analytics Tools
13.	SPMDA-1	Design Thinking – A Primer
14.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 6: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Cyber Security**

<b>Cyber Security</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/CS-1	Cryptography And Network Security
2.	SPMDA/CS-2	Ethical Hacking
3.	SPMDA/CS-3	Information Security – 5 – Secure Systems Engineering
4.	SPMDA/CS-4	Privacy and Security in Online Social Media
5.	SPMDA/CS-5	Information Theory and Coding
6.	SPMDA/CS-6	Introduction to Information Security
7.	SPMDA/CS-7	Introduction to Cryptology
8.	SPMDA/CS-8	Computational Number Theory & Cryptography
9.	SPMDA/CS-9	Hardware Security
10.	SPMDA/CS-10	Internetwork Security
11.	SPMDA/CS-11	Introduction to Machine Learning
12.	SPMDA/CS-12	Introduction to Internet of Things
13.	SPMDA-1	Design Thinking – A Primer
14.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 7: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in 3D Printing**

<b>3D Printing</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/3D-1	Rapid Manufacturing
2.	SPMDA/3D-2	Electronics Equipment Integration and Prototype Building
3.	SPMDA/3D-3	Product Design and Development
4.	SPMDA/3D-4	The Future of Manufacturing Business: Role of Additive Manufacturing
5.	SPMDA/3D-5	Functional and Conceptual Design
6.	SPMDA/3D-6	Introduction to Polymer Science
7.	SPMDA/3D-7	Innovation by Design
8.	SPMDA/3D-8	Design, Technology and Innovation
9.	SPMDA-1	Design Thinking – A Primer
10.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 8: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Electric Vehicles**

<b>Electric Vehicles</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/EV-1	Fundamentals of Electric Vehicles: Technology & Economics
2.	SPMDA/EV-2	Fundamentals of Electrical Engineering
3.	SPMDA/EV-3	Electrical Machines
4.	SPMDA/EV-4	Physics of Materials
	SPMDA/EV-5	<b>OR</b> Powder Metallurgy
5.	SPMDA/EV-6	Introduction to CFD
6.	SPMDA/EV-7	Structural Analysis of Nanomaterials
7.	SPMDA/EV-8	Ecology and Environment
8.	SPMDA/EV-9	Dynamic Behavior of Materials
9.	SPMDA/EV-10	Welding of Advanced High Strength Steels for Automotive Applications
10.	SPMDA/EV-11	Dynamical System and Control
11.	SPMDA-1	Design Thinking - A Primer
12.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 9: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Energy Engineering**

<b>Energy Engineering</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/EE-1	Fundamentals of Conduction and Radiation
	SPMDA/EE-2	<b>OR</b> Fundamentals of Convective Heat Transfer
2.	SPMDA/EE-3	Energy Conservation and Waste Heat Recovery
3.	SPMDA/EE-4	Ecology and Environment
4.	SPMDA/EE-5	Energy Economics and Policy
5.	SPMDA/EE-6	Bioenergy
	SPMDA/EE-7	<b>OR</b> Waste to Energy Conversion
6.	SPMDA/EE-8	Non-Conventional Energy Resources
	SPMDA/EE-9	<b>OR</b> Technologies for Clean and Renewable Energy Production
7.	SPMDA/EE-10	Selection of Nanomaterials for Energy Harvesting and Storage Application
8.	SPMDA/EE-11	Solar Energy Engineering and Technology
9.	SPMDA-1	Design Thinking - A Primer
10.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 10: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Mechatronics**

<b>Mechatronics</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/ME-1	Power Electronics
2.	SPMDA/ME-2	Semiconductor Optoelectronics
	SPMDA/ME-3	<b>OR</b> Semiconductor Devices and Circuits
3.	SPMDA/ME-4	Digital Circuits
4.	SPMDA/ME-5	Analog Electronic Circuits
5.	SPMDA/ME-6	Control Systems
	SPMDA/ME-7	<b>OR</b> Control Engineering
6.	SPMDA/ME-8	Introduction to Internet of Things
7.	SPMDA/ME-9	Introduction to Fuzzy Set Theory, Arithmetic and Logic
	SPMDA/ME-10	<b>OR</b> Switching Circuits and Logic Design
8.	SPMDA/ME-11	Microcontrollers and Applications
9.	SPMDA/ME-12	Introduction to Embedded System Design
10.	SPMDA/ME-13	Introduction to Robotic
11.	SPMDA/ME-14	Optical Fiber Sensors
12.	SPMDA/ME-15	Automation in Manufacturing
13.	SPMDA-1	Design Thinking - A Primer
14.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 11: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Computer Science and Biology**

<b>Computer Science and Biology</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/CB-1	Computational Systems Biology
2.	SPMDA/CB-2	Introduction to Database Systems
3.	SPMDA/CB-3	Introduction to Artificial Intelligence
	SPMDA/CB-4	<b>OR</b> Artificial Intelligence Search Methods for Problem Solving
4.	SPMDA/CB-5	Image Signal Processing
5.	SPMDA/CB-6	Introduction to Internet of Things
6.	SPMDA/CB-7	Introduction to Computer Graphics
	SPMDA/CB-8	<b>OR</b> Computer Graphics
7.	SPMDA/CB-9	MATLAB Programming for Numerical Computation
8.	SPMDA/CB-10	Programming, Data Structures and Algorithms in Python
9.	SPMDA/CB-11	Introduction to Machine Learning
10.	SPMDA/CB-12	Data Mining
11.	SPMDA/CB-13	Introduction to Dynamical Models in Biology
12.	SPMDA/CB-14	Biometrics
13.	SPMDA/CB-15	BioInformatics: Algorithms and Applications
14.	SPMDA/CB-16	Introduction to Proteogenomics
15.	SPMDA/CB-17	Foundations of Cryptography
16.	SPMDA/CB-18	Modern Application Development
17.	SPMDA/CB-19	Ethical Hacking
18.	SPMDA/CB-20	Computer Aided Drug Design
19.	SPMDA/CB-21	Functional Genomics
20.	SPMDA-1	Design Thinking - A Primer
21.	SPMDA-2	Ethics in Engineering Practice



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 12: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Drug Engineering**

<b>Drug Engineering</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/DE-1	Drug Delivery: Principles and Engineering
2.	SPMDA/DE-2	Experimental Biotechnology
3.	SPMDA/DE-3	Spectroscopic Techniques for Pharmaceutical and Biopharmaceutical Industries
4.	SPMDA/DE-4	Environmental Quality Monitoring & Analysis
5.	SPMDA/DE-5	Computer Aided Drug Design
6.	SPMDA/DE-6	Current Regulatory Requirements for Conducting Clinical Trials in India for Investigational New Drugs/New Drug
7.	SPMDA/DE-7	Introduction to Dynamical Models in Biology
8.	SPMDA/DE-8	Medical Biomaterials
9.	SPMDA/DE-9	Metals in Biology
10.	SPMDA/DE-10	Gene Therapy
11.	SPMDA/DE-11	Introduction to Cardiovascular Fluid Mechanics
12.	SPMDA/DE-12	Optical Sensors
13.	SPMDA/DE-13	Nano Structured Materials- Synthesis, Properties, Self-assembly and Applications
14.	SPMDA/DE-14	Transport Phenomena in Biological Systems
15.	SPMDA/DE-15	Aspects of Biochemical Engineering
16.	SPMDA/DE-16	Process Control Design, Analysis and Assessment
17.	SPMDA/DE-17	Industrial Biotechnology
18.	SPMDA/DE-18	Interactomics
19.	SPMDA/DE-19	Health Research Fundamentals
20.	SPMDA/DE-20	Computational Systems Biology
21.	SPMDA/DE-21	Human Molecular Genetics
22.	SPMDA-1	Design Thinking - A Primer
23.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 13: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Genome Engineering & Technology**

<b>Genome Engineering &amp; Technology</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/GE-1	Introduction to Proteogenomics
2.	SPMDA/GE-2	Interactomics: Basics & Applications
3.	SPMDA/GE-3	Drug Delivery: Principles and Engineering
4.	SPMDA/GE-4	Experimental Biotechnology
5.	SPMDA/GE-5	Bioengineering: An Interface with Biology and Medicine
6.	SPMDA/GE-6	Functional Genomics
7.	SPMDA/GE-7	Protein and Gel Based Proteomics
8.	SPMDA/GE-8	Cell Culture Technologies
9.	SPMDA/GE-9	Tissue Engineering
10.	SPMDA/GE-10	Biomedical Nanotechnology
11.	SPMDA/GE-11	Introductory Mathematical Methods for Biologists
12.	SPMDA/GE-12	Nanotechnology in Agriculture
13.	SPMDA/GE-13	Introduction to Proteomics
14.	SPMDA/GE-14	Applications of Interactomics using Genomics and Proteomics Technologies
15.	SPMDA/GE-15	Transport Phenomena in Biological Systems
16.	SPMDA/GE-16	Proteomics and Genomics
17.	SPMDA/GE-17	Medical Biomaterials
18.	SPMDA/GE-18	Thermodynamics for Biological Systems: Classical and Statistical Aspect
19.	SPMDA/GE-19	Mass Spectrometry Based Proteomics
20.	SPMDA/GE-20	Advanced Clinical Proteomics
21.	SPMDA/GE-21	Application of Spectroscopic Methods in Molecular Structure Determination
22.	SPMDA/GE-22	Gene Therapy
23.	SPMDA-1	Design Thinking - A Primer
24.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 14: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Fashion Marketing and Merchandising**

<b>Fashion Marketing and Merchandising</b> <b>(Minimum credits to be earned are EIGHTEEN-TWENTY)</b>		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/FMM-1	Fabric Manufacture-I
2.	SPMDA/FMM-2	Quality Control in Textile Industry
3.	SPMDA/FMM-3	Textured Yarn Technology
4.	SPMDA/FMM-4	High Performance and Specialty Fibres
5.	SPMDA/FMM-5	Natural Dyes
6.	SPMDA/FMM-6	Knitting Technology
7.	SPMDA/FMM-7	Supply Chain Analytics
8.	SPMDA/FMM-8	Security Analysis & Portfolio Management
9.	SPMDA/FMM-9	Product Design Using Value Engineering
10.	SPMDA/FMM-10	Introduction to Marketing Essentials
11.	SPMDA/FMM-11	Soft Skills For Business Negotiation And Marketing Strategies
12.	SPMDA-1	Design Thinking - A Primer
13.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 15: List of elective subjects for acquiring additional 18-20 credits for B.Tech (Hons.) with Specialization/Minor Degree in Technical Textile**

<b>Technical Textile</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/TT-1	Technical Textiles
2.	SPMDA/TT-2	Textile Finishing
3.	SPMDA/TT-3	Science of Clothing Comfort
4.	SPMDA/TT-4	Mechanics of Textile Machinery
5.	SPMDA/TT-5	Testing of Functional And Technical Textiles
6.	SPMDA/TT-6	Textile Fibres
7.	SPMDA/TT-7	Science and Technology of Weft and Wrap Knitting
8.	SPMDA/TT-8	Nonwoven Technology
9.	SPMDA/TT-9	High Performance and Specialty Fibres
10.	SPMDA/TT-10	Natural Dyes
11.	SPMDA/TT-11	Evaluation of Textile Materials
12.	SPMDA/TT-12	Advanced Textile Printing Technology
13.	SPMDA/TT-13	Textile Testing
14.	SPMDA-1	Design Thinking - A Primer
15.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 16: List of elective subjects for acquiring additional 18-20 credits for B.Tech. (Hons.) with Specialization/Minor Degree in Aerospace Propulsion**

<b>Aerospace Propulsion</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/AP-1	Computational Science in Engineering
2.	SPMDA/AP-2	Gas dynamics
3.	SPMDA/AP-3	Rocket Propulsion
4.	SPMDA/AP-4	Introduction to Air breathing Propulsion
5.	SPMDA/AP-5	IC Engines and Gas turbine
6.	SPMDA/AP-6	Nature and properties of materials
7.	SPMDA/AP-7	Steam and Gas power system
8.	SPMDA/AP-8	Kinematics of Mechanisms and Machines
9.	SPMDA/AP-9	Lighter than air
10.	SPMDA/AP-10	Introduction to launch vehicle analysis and design
11.	SPMDA-1	Design Thinking - A Primer
12.	SPMDA-2	Ethics in Engineering Practice

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

**Table 17: List of elective subjects for acquiring additional 18-20 credits for B.Tech. (Hons.) with Specialization/Minor Degree in Smart Cities**

<b>Smart Cities</b> (Minimum credits to be earned are EIGHTEEN-TWENTY)		
<i>Note: Credit of the subject/s which are counted for earning 160 credits of the degree will not be counted for acquiring Hons. with Specialization/Minor Degree.</i>		
<b>Sr. No.</b>	<b>Code</b>	<b>Subject Nomenclature</b>
1.	SPMDA/SC-1	Integrated Waste Management for A Smart City
2.	SPMDA/SC-2	Sustainable Transportation Systems
3.	SPMDA/SC-3	Water and Waste Water Treatment
4.	SPMDA/SC-4	Urban Transport Systems Planning
5.	SPMDA/SC-5	Introduction to Multimodal Urban Transportation Systems
6.	SPMDA/SC-6	Earthquake Resistant Design of Foundations
7.	SPMDA/SC-7	Water Supply Engineering
8.	SPMDA/SC-8	Global Navigation Satellite Systems And Application
9.	SPMDA/SC-9	Environmental Air Pollution
10.	SPMDA/SC-10	Environmental Geotechnics
11.	SPMDA-1	Design Thinking - A Primer
12.	SPMDA-2	Ethics in Engineering Practice

**Guidelines to implement the MOOCs/ SWAYAM online courses in the  
affiliated institutes of the University**

In pursuance to the Gazette Notification No. 295 dated 19th July 2016 of University Grants Commission notifying the “UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulations, 2016” for adoption of MOOCs (Massive Open Online Courses) through SWAYAM (Study Web of Active Learning by Young and Aspiring Mind) platform, KUK has framed the following guidelines for implementation of Online courses in all the affiliated institutes:

1. These guidelines shall be called the “Guidelines to implement the SWAYAM/ MOOCs/ other authorized online courses (OAOC), in the University”.

2. These guidelines shall apply to the transfer of credits of such students who are enrolled as students in any of the department of the Institute/University.

3. These shall come into force from the date of approval of the Academic Council of the Institute/University.

4. The procedure for adopting Online Learning Courses:

4.1 The Principal Investigator (PI), a Subject Matter Expert entrusted by the National MOOCs Coordinator (NMC) or equivalent agency, will offer the online learning courses for the forthcoming Semester through an institution (called Host Institution). The courses will be made available through the online portal twice a year (for odd semester and even semester).

4.2 Once the list of online learning courses to be offered in the forthcoming Semester is available on SWAYAM/NPTEL (National Programme on Technology Enhanced Learning)/ Authorized Portal Offering Online Courses (APOOC), Head/Faculty Incharge of the Department shall notify a list of courses from SWAYAM/NPTEL portal/APOOC keeping in view the academic requirements of students, subject to the approval of Academic Council of the Institute/University.

4.3 The Head/Faculty Incharge of the Department will recommend the courses of SWAYAM/NPTEL/OAOC to the Authorities of the Institute/University, if:

## **KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

('A+' Grade NAAC Accredited)

4.3.1 There is non-availability of suitable teaching staff or running a course in the department.

4.3.2 The facilities for offering the elective papers (courses), sought for by the students are not on offer in the department, but are available on the SWAYAM/NPTEL/APOOC platform.

4.3.3 The courses offered on SWAYAM/NPTEL/APOOC would supplement the teaching-learning process in the department.

4.4 The Head/Faculty Incharge of the Department shall ensure that the physical facilities like laboratories, computer facilities, library etc., as essential for pursuing the courses, are available inadequate measure.

4.5 Every student is required to register for and complete (minimum) one course out of those offered by the department and pay for the certification registration fee on the online platform of the portal meant for it.

4.6 The constituent college/school must designate an Online Course Coordinator (OCC) in the respective department along with a relevant course faculty (for each SWAYAM/NPTEL/OAOC course) who will be responsible to guide the students throughout the course and to facilitate/conduct the Lab/Practical sessions/examinations. The OCC will monitor compliance of these guidelines, keeping the Head/Faculty Incharge apprised of the progress, time to time, and also collect relevant documents from each online course faculty for record purposes, at the end of a course.

### **5. Evaluation and Certification of SWAYAM/MOOCs/Online courses:**

5.1 The Host Institution and the PI shall be responsible for evaluating the students registered for the MOOCs course launched by him/her.

5.2 The evaluation done by the Host Institution shall be based on predefined norms and parameters and shall be on a comprehensive evaluation throughout the length and breadth of course based on specified instruments like discussions, forums, quizzes, assignments, sessional examinations and final examination.

5.3 The examination for certification may be in online mode or a pen & paper mode as decided by PI and Host Institution. This shall be announced by the PI/Host Institution in the overview of the Course at the time it is offered.



**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

(Established by the State Legislature Act XII of 1956)

(‘A+’ Grade NAAC Accredited)

5.4 In case, a pen and paper final examination is to be conducted, the same shall be offered through any college/school volunteering to conduct the same. The decision in this respect will be of the PI and the Host Institution.

5.5 After conduct of the examination and completion of the evaluation, the PI through the Host Institution shall award marks/grade as per the evaluation scheme announced.

5.6 The final marks/grade shall be communicated to the students as well as the department/Institute/University generally within four weeks from the date of completion of the final examination.

5.7 The concerned department shall forward the marks/grade to the Office of the Controller of Examinations to incorporate into mark sheet/grade card of the students.

5.8 The Office of the Controller of Examinations shall give the equivalent credit weightage to the students for the credits earned through online learning courses (not more than 20% of courses in any semester). In case the completed course has been selected by the student towards the grant of Minor degree/Hons. in a particular Emerging Area offered by the Institute, it should clearly be specified by the student and verified and communicated to the Office of the Controller of Examinations by the Heads/ Faculty Incharge.

5.9 These marks/grade will be reflected on the student’s mark sheet/grade card and may be counted for final award of the degree by the University.

5.10 The courses in which Lab/Practical Component is involved, the concerned department shall evaluate the students for the practical/lab component and the marks/grade obtained by the students be forwarded to the Office of the Controller of Examinations for incorporation into marks sheet/grade card.

5.11 The PI through its Host Institution will send to Department/Institute/University Certificate(s) in respect of all those students who would have successfully completed the MOOCs course. Heads/Faculty Incharge of the concerned department will ensure the award of these certificates to the concerned students.

**Institute of Law**  
**Kurukshetra University, Kurukshetra**  
**Course of Study for B. A. LL. B. (Hons) 5-Year Integrated Course**

**Fourth Year**

Paper	Semester-VII	Paper	Semester-VIII
Subject Code	Subject	Subject Code	Subject
701(A)	History –I	801(A)	History –II
701 (B)	Defence and Strategic Studies-I	801 (B)	Defence and Strategic Studies-II
702	Civil Procedure Code -I	802	Civil Procedure Code –II and Limitation Act
703	Principles of Taxation Law	803	Indirect Taxation Laws
704	Interpretation of Statutes & Principles of Legislation	804(A)	Intellectual Property Law
		804 (B)	Investment and Securities Laws
705(A)	Human Rights Law and Practices	805 (A)	Gender Justice and Feminist Jurisprudence
705(B)	International Trade Law	805 (B)	Media and Law
706	Professional Ethics, Accountancy for Lawyers & Bench Bar Relations (Practical-1)	806	Alternative Dispute Resolution and Legal Aid (Practical-II)

**BALLB(Hons.) 5 year Integrated Course**  
**VII- Semester**  
**Defence and Strategic Studies-I**  
**(Theory and Concepts)**

**Paper 701(Option B)**

**Internal Assessment : 20 Marks**  
**Theory : 80 Marks**  
**Total : 100 Marks**  
**Time : 3 Hours**

**Note:**

- a) Nine questions shall be set in all, two questions in each Unit I-IV and one compulsory question in Unit-V.
- b) The compulsory question in Unit-V shall consist of four parts, one from each unit I-IV.
- c) The candidate shall be required to attempt five questions in all, selecting one question from each Unit I-IV and question no. 9 in Unit V shall be compulsory.
- d) Each question in Unit I-IV shall carry 15 marks and question no. 9 in Unit-V shall carry 20 marks.

**Unit-I**

Kautilya : Philosophy of War, Sun Tzu : Art of War, Mao Tse Tung: Views on Guerrilla Warfare, Douhet :Views on Air power, Mahan: Views on Sea Power and Navel Warfare and General introduction of Geneva Convention, 1949.

**Unit-II**

Defence and Strategic Studies: Meaning and Definitions, Its Relevance and Significance, Relationship of Defence and Strategic Studies with other disciplines with special emphasis on Law.

Definitions and meaning of basic concepts: War, Campaign, Battle, Strategy, Tactics, Security and Defence.

**Unit-III**

Warfare : historical Evolution, Features, Causes, Principles and Types  
Modern Warfare : Concept, Definitions and Features

**Unit—IV**

Guerrilla Warfare: Origin and Concept, Principles,, Techniques and Characteristics of Guerrilla Warfare and Counter Guerrilla Measures.

Psychological Warfare : Definitions and Concept, Functions and Limitations.

Nuclear Warfare : Beginning of Nuclear Era and Effects of Nuclear Explosion, Nuclear Strategies of Deterrence and Massive Retaliation and ABC Warfare (Atomic, Biological or Chemical )

**Suggested Reading:**

- 1. Anthony James Joes, Guerrilla Conflict before the Cold war (1996) Praeger Publishers.
- 2. Bernard Montgomery, A History of Warfare : Field –Marshal Viscount Montgomery of Alamein (1983) William Morrow & Co., New York City.
- 3. Carl Von Clausewitz, “Principles of War”(2003) Dover Publication Inc.
- 4. D.K. Palit, Essentials of Military Knowledge,(2003) Natraj Publication Dehradun.
- 5. F.M. Osanka, Modern Guerrilla Warfare, (1962) Free Press of Glencoe, New York.

6. Geoffery Blainey, The Cause of War, (1973) Macmillan, London.
7. J.A. Khan Probing War and Warfare (2005) APH Publication, New Delhi.
8. J.F.C Fuller, The Conduct of War 1789-1961 : A Study of the Impact of the French, Industrial and Russian Revolutions on War and Its Conduct Publisher : Da Capo Press; Reprint edition (March 22, 1992)
9. K.S. Sidhu, War and Its Principles, (1988) Atlantic, New Delhi.
10. KS Tripathi, Evolution of Nuclear Strategies, (1970) Vikas Publication, New Delhi.
11. Marshal Foch, The Principle of War,(1972) Reliance Publishing House New Delhi.
12. Nagendra Singh, The Defence Mechanism and the Modern State, (1974) Asia Publishing House, New Delhi
13. Quincy Wright Study of War,(1942) University of Chicago Press.
14. Ravi Nanda, Evolution of National Strategy, (1987) South Asia Books, 1st Edition
15. Raymond Aron, Peace and War : A Theory of International Relations (1966) Praeger, New York.
16. Richard E. Barringer, War : Patterns of Conflict (1972)MIT Press, Cambridge Mass.
17. Stanislav Andreski, Military Organisation and Society (1968) Berkely University of California Press.

**BALLB(Hons.) 5 Year Integrated Course**  
**VIII- Semester**  
**Defence and Strategic Studies-II**  
**National Security of India**

**Paper 801(Option B)**

**Internal Assessment : 20 Mark**  
**Theory : 80 Marks**  
**Total : 100 marks**  
**Time : 3 hours**

**Note:**

- a) Nine questions shall be set in all, two questions in each Unit I-IV and one compulsory question in Unit-V
- b) The compulsory question in Unit-V shall consist of four parts, one from each unit I-IV.
- c) The candidate shall be required to attempt five questions in all, selecting one question from each Unit I-IV and question no. 9 in Unit V shall be compulsory.
- d) Each question in Unit I-IV shall carry 15 marks and question no. 9 in Unit—V shall carry 20 marks.

**Unit-I**

National Security

- a. Meaning and Definition
- b. Threat Perceptions

Elements of National Security

- a. Geography
- b. Mineral resources
- c. Social, Political and Economic Factors
- d. Scientific and Technological Development
- e. Military Preparedness

**Unit-II**

India's Security issue since 1947

- a. Geo Political effects of Partition.
- b. Effects of Partition on Armed Forces

**Unit-III**

Internal Dimension of India's Security

- a. Terrorism in Jammu & Kashmir
- b. Insurgency in North Eastern States
- c. Naxalism

**Unit IV**

External Dimensions of India's Security

- a. India and Pakistan : Security Issues and Wars

b. India and China: Security Issues and Wars

**Suggested Readings**

1. Barry Buzan, People, State and Fear (1987) Trans Asia Publication, New Delhi.
2. Hasn J. Morgenthau, Politics Among Nations (1969) Scientific Book Agency Calcutta.
3. Jaswant Singh, Defending India (1999) Palgrav Macmillan India Ltd, New Delhi.
4. Joseph Frankel (1970) National Interest, Macmillan London.
5. Ken Booth, Theory of World Security (2007) Cambridge University Press, Cambridge.
6. Lorne J. Kavic, India's Quest for Security : Defence Policies 1947-1965, (1967) University of California Press, Los Angeles.
7. Military Balance, Latest Edition, The International Institute for Strategic Studies (IISS).
8. Norman D. Palmer and Howard C. Perkins, International Relations (1968) Scientific Book Agency, Calcutta.
9. Nagendra Singh, The Defence Mechanism and the Modern State, (1974) Asia Publishing House, New Delhi.
10. P.V.R. Rao, Defence Without Drift, (1970) Popular Prakshan Bombay.
11. Ramakrishana Rao and R..C Sharma, India's Borders (1991) Scholar Publishing Forum, New Delhi
12. Ross Babbage and Sandy Gordon India's Strategic Future (1992) Oxford University Press, Delhi.
13. R.K. Chatterjee India's Land Borders- Problems and Challenges (1978) Sterling Publishers, New Delhi
14. Rahul Roy Chowdhary, Sea Power and India's Security, (1995) Brassey's London.
15. Subrata Roy Chowdhary, Military Alliance and Neutrality in War and Peace, (1966) Orient Longman, New Delhi
16. S.T. Das, National Security in Perspective, (1987) Gyan Publishing House, New Delhi.
17. SIPRI Year Book, Latest edition.
18. V.P. Menon, The Story of the Integration of India States (1961) Orient Longman, New Delhi
19. V.K. Nayar, Threats From Within, (1992) Lancer Publications, New Delhi.

**B.A. LL.B.(Hons.) 5 –Year Integrated Course  
II-Semester**

**Paper 205**

**Law of Consumer Protection and Competition**

**Internal Assessment:20 Marks**

**Theory: 80Marks**

**Total: 100 Marks**

**Time: 3 hours**

Note:

- (a) Nine questions shall be set in all, two questions in each unit I-IV and one compulsory question in unit-V.
- (b) The compulsory question in unit-V shall consist of four parts, one from each Unit I-IV.
- (c) The Candidate shall be required to attempt five questions in all, selecting one question from each Unit I-IV and question no. 9 in Unit- V shall be compulsory.
- (d) Each question in Unit I-IV shall carry 15 marks and question no. 9 in Unit -V shall carry 20 Marks.

**UNIT-I**

Consumer Protection-International and National Developments, The Consumer Protection Act, 2019- Nature and Scope; Definitions and Scope of the Concepts of Consumer, Complaint, Complainant, Consumer Dispute, Goods, Service, Defect, Deficiency, Spurious Goods and Services; Product Liability Deficiency in Medical Services, Insurance Services, Banking Services, Housing Services etc. Rights of Consumers; Consumer Protection Councils – their composition and role. Endorsers's liability, central consumer protection authority

**Case:-M/S Spring Meadows Hospital & anr. v. Harjot Ahluwalia, AIR 1998 SC 1801; (1998) I CPJ 1 (SC)**

**UNIT-II**

Mediation, Consumer Disputes Redressal Commission- District Commission, its composition, Jurisdiction, Manner of Making Complaint, Procedure on admission of Complaint; State Commission – Composition, Jurisdiction- Original, Appellate and revisional; Procedure applicable to the State Commission; National Commission- Composition, Jurisdiction- Original Appellate, revisional; power of review; procedure applicable to National Commission; Circuits Benches Appeal to the Supreme Court.

**Case:- Ashish Handa Advocate v. Hon'ble The Chief Justice of High Court of Punjab & Haryana, AIR 1996 S.C. 1308**

**UNIT-III**

Unfair Trade Practices – Definition and Scope, Specific categories of unfair trade practices, Restrictive Trade Practice- Definition and Scope, Remedies available to Consumers, Period of Limitation, Administration Control, Enforcement of orders of District Forum, State Commission and National Commission, Dismissal of Frivolous or Vexatious Complaint, Penalties.

**Case:- Lucknow Development Authority v. M.K. Gupta AIR 1994 SC 787; (1993) III CPJ 7 (SC)**

**UNIT-IV**

The Competition Act, 2002 –Background and Salient Features of the Act, Preliminary (Section 1 -2) , Prohibition of certain Agreements , Abuse of Dominant Position and Regulation of Combinations ( Section 3-6), Competition Commission of India ( Section 7-17), Duties , Powers and Functions of Commission ( Section 18-39) , Competition Appellate Tribunal(Section 53A -53U).

### **Statutory Material**

- (i) The Consumer Protection Act, 2019
- (ii) The Competition Act, 2002

### **Suggested Readings**

Agarwal, V.K.	Law of Consumer Protection (Student Edition)
G.B. Reddy & Baglekar	Consumer protection Act : A Commentary
Akash Kumar	
N.V. Pranjape	Consumer Protection Law in India
Ajay Jagga Adv.	The consumer Protection Act, 2019
	Taxman's Consumer protection Law & Practice
V.P. Bhagat	Commentary on the consumer protection Act,
Kumar Keshav	2019
Justice S.N. Aggarwal	Supreme Court on Consumer Protection Act.
S.M. Duhgar	Guide to competition Law (Containing Commentary on the
	Competition Act, 2021
Aggarwal V.K.	The Competition Act, 2002



# **BBA. LL.B.(Hons.) 5 –Year Integrated Course**

## **II-Semester**

**Paper 205 - A**

**Law of Consumer Protection and Competition**

**Internal Assessment:20 Marks**

**Theory: 80Marks**

**Total: 100**

**Marks**

**Time: 3 hours**

**Note:**

- (a) Nine questions shall be set in all, two questions in each unit I-IV and one compulsory question in unit-V.
- (b) The compulsory question in unit-V shall consist of four parts, one from each Unit I-IV.
- (c) The Candidate shall be required to attempt five questions in all, selecting one question from each Unit I-IV and question no. 9 in Unit- V shall be compulsory.
- (d) Each question in Unit I-IV shall carry 15 marks and question no. 9 in Unit -V shall carry 20 Marks.

### **UNIT-I**

Consumer Protection-International and National Developments, The Consumer Protection Act, 2019- Nature and Scope; Definitions and Scope of the Concepts of Consumer, Complaint, Complainant, Consumer Dispute, Goods, Service, Defect, Deficiency, Spurious Goods and Services; Product Liability Deficiency in Medical Services, Insurance Services, Banking Services, Housing Services etc. Rights of Consumers; Consumer Protection Councils – their composition and role. Endorsers's liability, central consumer protection authority

**Case:-M/S Spring Meadows Hospital & anr. v. Harjot Ahluwalia, AIR 1998 SC 1801; (1998) I CPJ 1 (SC)**

### **UNIT-II**

Mediation, Consumer Disputes Redressal Commission- District Commission, its composition, Jurisdiction, Manner of Making Complaint, Procedure on admission of Complaint; State Commission – Composition, Jurisdiction- Original, Appellate and revisional; Procedure applicable to the State Commission; National Commission- Composition, Jurisdiction- Original Appellate, revisional; power of review; procedure applicable to National Commission; Circuits Benches Appeal to the Supreme Court.

**Case:- Ashish Handa Advocate v. Hon'ble The Chief Justice of High Court of Punjab & Haryana, AIR 1996 S.C. 1308**

### **UNIT-III**

Unfair Trade Practices – Definition and Scope, Specific categories of unfair trade practices, Restrictive Trade Practice- Definition and Scope, Remedies available to Consumers, Period of Limitation, Administration Control, Enforcement of orders of District Forum, State Commission and National Commission, Dismissal of Frivolous or Vexatious Complaint, Penalties.

**Case:- Lucknow Development Authority v. M.K. Gupta AIR 1994 SC 787; (1993) III CPJ 7 (SC)**

### **UNIT-IV**

The Competition Act, 2002 –Background and Salient Features of the Act, Preliminary (Section 1 -2) , Prohibition of certain Agreements , Abuse of Dominant Position and Regulation of Combinations ( Section 3-6), Competition Commission of India ( Section 7-17), Duties , Powers and Functions of Commission ( Section 18-39) , Competition Appellate Tribunal(Section 53A -53U).

### **Statutory Material**

- (i) The Consumer Protection Act, 2019
- (ii) The Competition Act, 2002

### **Suggested Readings**

Agarwal, V.K.	Law of Consumer Protection (Student Edition)
G.B. Reddy& Baglekar	Consumer protection Act : A Commentary
Akash Kumar	
N.V. Pranjape	Consumer Protection Law in India
Ajay Jagga Adv.	The consumer Protection Act, 2019
	Taxman's Consumer protection Law & Practice
V.P. Bhagat	Commentary on the consumer protection Act,
Kumar Keshav	2019
Justice S.N. Aggarwal	Supreme Court on Consumer Protection Act.
S.M. Duhgar	Guide to competition Law (Containing Commentary on the
	Competition Act, 2021
Aggarwal V.K.	The Competition Act, 2002



**UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY**

(A constituent Autonomous Institute and Recognized by UGC under Section 12(B) and 2(f))

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Established by the state Legislature Act XII of 1956

*(‘A+’ Grade, NAAC Accredited)*

**MASTER OF TECHNOLOGY  
IN  
DEFENCE TECHNOLOGY (w. e. f. 2021-22)**

**Scheme and Syllabai of Examination**

## Program Outcomes

S.No.	Program Outcome	Attributes
PO-01	Acquire technical competence, comprehensive knowledge and understanding the methodologies and technologies associated with land, air & naval defence systems. Apply knowledge to identify, formulate and analyse complex engineering problems	Scholarship of Knowledge
PO-02	Having an ability to apply knowledge of science, mathematics, engineering & technology for development of defence technologies.	Critical Thinking
PO-03	Having an ability to design a component, subsystem or a system applying all the relevant standards and with realistic constraints, including operational and environmental	Research Skill
PO-04	Acquire the skills for uses of contemporary techniques, resources and modern engineering and IT tools	Usages of Modern Techniques
PO-05	An ability to identify, investigate, understand and analyse complex problems, apply creativity, carry out research /investigation and development work to solve practical problems related to defence technological issues	Design, Development & Solutions
PO-06	Ability to communicate effectively in both oral and written contexts in the form of technical papers, project reports, design documents and seminar presentations	Communication
PO-07	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Individual &Team Work

# Semester -I



# UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY

(A constituent Autonomous Institute and Recognized by UGC under Section 12(B) and 2(f))

**KURUKSHETRA UNIVERSITY, KURUKSHETRA**

Established by the state Legislature Act XII of 1956

('A+' Grade, NAAC Accredited)

**MASTER OF TECHNOLOGY**

**IN**

**DEFENCE TECHNOLOGY (w. e. f. 2021-22)**

## SEMESTER-1

Sr. No.	Course Code	SUBJECT	L	T	P	Total	Minor Test	Major Test	Cr.	Duration of Exam (Hrs.)
1	DT-01-01	Systems and warfare Platforms	4	-	-	4	40	60	4	3
2	DT-01-02	Warfare Simulations & Strategies	4	-	-	4	40	60	4	3
3	DT-01-03	Advanced Engineering Mathematics	4	-	-	4	40	60	4	3
4	DT-01-L01	Systems and Platforms Lab	-	-	4	4	40	60	2	3
5	DT-01-L02	Warfare Simulations & Strategies Lab	-	-	4	4	40	60	2	3
6	*	Elective-I	3	-	-	3	40	60	3	3
7	**	Elective-II	3	-	-	3	40	60	3	3
8		Seminar	-	-	2	2	100	-	1	3
<b>Total</b>			<b>18</b>	<b>-</b>	<b>10</b>	<b>28</b>	<b>380</b>	<b>420</b>	<b>23</b>	
							<b>800</b>			

### **\*LIST OF ELECTIVES - I for 1<sup>st</sup> Semester**

Sr. No.	Course Code	Course of Study
1.	DT-EL1-01	Rockets & Missiles Fundamentals
2.	DT-EL1-02	Advanced Thermal Engineering
3.	DT-EL1-03	Numerical methods for science & engineering
4.	DT-EL1-04	Communication Technology
5.	DT-EL1-05	Advanced Mechanical Engineering

### **\*\*LIST OF ELECTIVES - II for 1<sup>st</sup> Semester**

Sr. No.	Course Code	Course of Study
1.	DT-EL2-01	Autonomy and Navigation Technology
2.	DT-EL2-02	Optimization theory & applications
3.	DT-EL2-03	Military Electronics System Engineering
4.	DT-EL2-04	System Engineering & Analysis

Students are expected to select the Elective courses of their choice, provided that at least a group of 7 students should opt for the similar elective course

# Semester -II

**SEMESTER-II**  
**MASTER OF TECHNOLOGY**  
**IN**  
**DEFENCE TECHNOLOGY (w. e. f. 2021-22)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

Sr. No.	Course Code	Subject	L	T	P	Total	Minor Test	Major Test	Cr.	Duration of Exam (Hrs.)
1	DT-CSS-01	Radar Technologies	4	-	-	4	40	60	4	3
2	DT-CSS-02	Digital & satellite Communication and Navigation from Space	4	-	-	4	40	60	4	3
3	DT-CSS-03	Tactical battlefield Communication & Electronic Warfare	4	-	-	4	40	60	4	3
4	DT-CSS-L01	Radar Technologies Lab	-	-	4	4	40	60	2	3
5	DT-CSS-L02	Digital & satellite Communication and Navigation from Space Lab	-	-	4	4	40	60	2	3
6	*	Elective-III	3	-	-	3	40	60	3	3
7	**	Elective-IV	3	-	-	3	40	60	3	3
8		Seminar	-	-	2	2	100	-	1	3
<b>Total</b>			<b>18</b>		<b>10</b>	<b>28</b>	<b>380</b>	<b>420</b>	<b>23</b>	
							<b>800</b>			

**SEMESTER-II**  
**MASTER OF TECHNOLOGY**  
**IN**

Sr. No.	Course Code	Subject	L	T	P	Total	Minor Test	Major Test	Cr.	Duration of Exam (Hrs.)
1	DT-DET-01	Directed Energy Sources (Lasers, Microwave)	4	-	-	4	40	60	4	3
2	DT-DET-02	Beam Control Technology, Target acquisition, Beam Pointing & Tracking	4	-	-	4	40	60	4	3
3	DT-DET-03	Directed Energy Weapons (DEW) System Engineering	4	-	-	4	40	60	4	3
4	DT-DET-L01	Directed Energy Sources (Lasers, Microwave) Lab	-	-	4	4	40	60	2	3
5	DT-DET-L02	Beam Control Technology, Target acquisition, Beam Pointing & Tracking Lab	-	-	4	4	40	60	2	3
6	*	Elective-III	3	-	-	3	40	60	3	3
7	**	Elective-IV	3	-	-	3	40	60	3	3
8		Seminar	-	-	2	2	100	-	1	3
<b>Total</b>			<b>18</b>	<b>-</b>	<b>10</b>	<b>28</b>	<b>380</b>	<b>420</b>	<b>23</b>	
							<b>800</b>			



**DEFENCE TECHNOLOGY (w. e. f. 2021-22)**  
**SPECIALIZATION: DIRECTED ENERGY TECHNOLOGY**

<b>*LIST OF ELECTIVES - III (for all Specializations) for 2<sup>nd</sup> Semester</b>		
Sr. No.	Course Code	Course of Study
1.	DT-EL3-01	Robotics (MSS, MCC)
2.	DT-EL3-02	EMI/EMC in Military Systems
3.	DT-EL3-03	Defence Electro-Optics and Imaging Systems
4.	DT-EL3-04	Structural Dynamics and Aero-elasticity
5.	DT-EL3-05	Safety, Health & Hazard Management
6.	DT-EL3-06	Fundamental of telemetry, telecomm and transponder
7.	DT-EL3-07	Jamming and ECM/ECCM technologies
8.	DT-EL3-08	Software defined Radios
9.	DT-EL3-09	Advanced Lightweight and Composite Structures
10.	DT-EL3-10	Test methodologies for DEW systems (Lasers & Microwave)
11.	DT-EL3-11	Advanced Analytical Techniques / Lab testing
12.	DT-EL3-12	Sonar System Engineering

<b>** LIST OF ELECTIVES - IV (for all Specializations) for 2<sup>nd</sup> Semester</b>		
Sr. No.	Course Code	Course of Study
1.	DT-EL4-01	Unmanned Aerial Vehicle Design
2.	DT-EL4-02	Naval Ocean Analysis and Prediction
3.	DT-EL4-03	Modeling & simulation of Laser Matter Interaction
4.	DT-EL4-04	Computational Aerodynamics
5.	DT-EL4-05	Launch Vehicle Design & Analysis
6.	DT-EL4-06	Acquisition, Tracking & Pointing Technology
7.	DT-EL4-07	Data acquisition, tracking & post flight analysis
8.	DT-EL4-08	Air independent propulsion & batteries
9.	DT-EL4-09	Advanced digital modulation technologies & standards
10.	DT-EL4-10	Trajectories modeling & simulation
11.	DT-EL4-11	Sensor Technology

Students are expected to select the Elective courses of their choice, provided that at least a group of 7 students should opt for the similar elective course

# Semester -III

**SEMESTER-III**

Sr. No.	Course Code	Subject	L	T	P	Total	Minor* Test	Major Test	Cr.	Duration of Exam (Hrs.)
1	DT-PDP-01	Project Dissertation- Phase 1	-	-	20	20	100	00	10	3
2		Seminar/Industrial Training	-	-	8	8	100	00	4	3
<b>Total</b>			-	-	<b>28</b>	<b>28</b>	<b>200</b>	-	<b>14</b>	
							<b>200</b>			

# Semester -IV

**SEMESTER-IV**

Sr. No.	Course Code		L	T	P	Total	Minor Test	Major Test	Cr.	Duration of Exam (Hrs.)
1	DT-PDP-02	Project Dissertation-Phase- 2	-	-	40	40	100	200	20	3
Total							100	200	20	
							300			

# Syllabus

### **INSTRUCTIONS FOR PAPER SETTER**

- The question paper is to be attempted in **THREE Hours**.
- Maximum Marks for the paper are **60**.
- The syllabus for the course is divided into **SIX units**.
- The paper will have a total of **THIRTEEN questions**.
- **Question No. 1**, which is compulsory, shall be OBJECTIVE Type and have content from the entire syllabus (all SIX Units).

<b>Q. No. 2 &amp; 3</b>	<b>from</b>	<b>Unit I</b>
<b>Q. No. 4 &amp; 5</b>	<b>from</b>	<b>Unit II</b>
<b>Q. No. 6 &amp; 7</b>	<b>from</b>	<b>Unit III</b>
<b>Q. No. 8 &amp; 9</b>	<b>from</b>	<b>Unit IV</b>
<b>Q. No. 10 &amp; 11</b>	<b>from</b>	<b>Unit V</b>
<b>Q. No. 12 &amp; 13</b>	<b>from</b>	<b>Unit VI</b>

- The candidate will attempt a total of **SEVEN questions**. **Q. No. 1** is compulsory and carries **12 marks**. The candidate shall attempt remaining **SIX questions each of 8 marks** by selecting **only one question from each unit**.
- A question may have any number of sections labeled as 1(a), 1(b), 1(c), 1(d), ---- 2(a), 2(b), --.A section may further have any number of subsections labeled as (i), (ii), (iii),.
- **SPECIAL INSRUCTIONS FOR Q. No. 1 ONLY**

**Question No. 1**, which is compulsory, shall be OBJECTIVE/ short answer type and have content from the entire syllabus with equal weightage of all Six Units.

**Emphasis is to be given on the basic concepts, analytical reasoning and understanding of the various topics in the subject.** This question may have a number of parts and/or subparts. The short questions could be combination of following types:

- Multiple Choice
- Yes/ No choice
- Fill in Blanks type
- Short numerical computations
- Short Definitions
- Matching of Tables

The above-mentioned question types is **only a Guideline**. Examiner could set the question as per the nature of the subject.

# Semester -I

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)**



DT-01-01	SYSTEMS AND WARFARE PLATFORMS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students about various types of military platforms used in air, naval & land warfare. Students will also be apprised for weapon system and self-protection strategies and techniques.						
Course Outcomes							
CO 1	Students will be able to understand types of warfare platform used for Army, Air and Marine and their design fundamentals.						
CO 2	Students will be able to understand the weapon systems like guns, ordnance, missiles projectiles, mines/ countermines, lasers, undersea weapons, air-launched weapons, anti-aircraft, anti-ship and anti-submarine.						

#### Unit I

**Types of platforms:** land, sea, air; Lifecycle: concept, design, pre-production, production, operations, support.

#### Unit II

**Ship design fundamentals:** buoyancy, stability, ship resistance, survivability; damage control, NBCD, crew numbers, power requirements. Submarine design: buoyancy, stability, hull/tank design, air interdependence

#### Unit III

**Mechanics of flight:** fixed and rotary wing, straight and level flight of aircraft, aircraft control and movement, aircraft control surfaces, aerodynamics, power requirements, range; speed, ceiling, survivability, payload

#### Unit IV

**Military vehicle fundamentals:** tracked, wheeled, A, B and C vehicles

#### Unit V

Weapon systems: guns, ordnance, missiles, rockets, bombs, sub- munitions, projectiles, mines/ countermines, lasers, undersea weapons, air-launched weapons, anti-aircraft, anti-personnel, anti-ship, anti-submarine

#### Unit VI

**Self-defence and Protection systems:** Armour, smoke, chaff, decoys; Introduction to instrumentation, lab tests and flight trials

#### Suggested Books:

1. "Light And Heavy Vehicle Technology ", by Nunney. Publisher Elsevier.
2. "Practical approach to motor vehicle engineering and maintenance", by Bon-nick Allan et. Al. Publisher: Yesdee.
3. "Automotive Vibration Control Technology: Fundamentals, Materials, Construction, Simulation, and Applications", by Trelleborg.
4. "An Introduction to Weapons Systems", by Yacov Bar-Shlomo. Publisher: Create Space Independent Publishing Platform.
5. "Heavy Vehicle Mechanics", by Ian Nicholson. Publisher: McGraw-Hill Education – Europe.
6. "Military Laser Technology for Defense: Technology for Revolutionizing 21st Century Warfare", by Alastair D. McAulay. Publisher: Wiley-Interscience; 1st edition.
7. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-01-02	WARFARE SIMULATIONS & STRATEGIES						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students about warfare system and affluent them with combat modeling using mathematical modeling.						
Course Outcomes							
CO 1	Students will be able to understand the systems used in warfare scenario.						
CO 2	Students will be able to understand combat simulation & modelling.						
CO 3	Students will be able to understand the war gaming simulation & modelling and human factor representation.						

### Unit I

**Introduction to Warfare systems:** air, surface, subsurface, littoral, electronic.

### Unit II

**Military capabilities:** air warfare, surface warfare, sub surface warfare, littoral warfare

### Unit III

Introduction to the methods used in modeling combat and their application in support of defence decision making and training, Combat simulation

### Unit IV

War gaming/interactive simulation, Lanchester's equations, Mathematical models of combat

### Unit V

War gaming and combat modeling in practice, manual war gaming

### Unit VI

Human factors representation in war gaming and combat modeling

### Suggested Books:

1. "Defense Modeling, Simulation, and Analysis: Meeting the Challenge". Publisher: National Academies Press (October 22, 2006).
2. "Introduction to Electronic Warfare Modeling and Simulation" by David L. Adamy". Publisher: Artech Print on Demand (October 31, 2002).
3. "Engineering Principles of Combat Modeling and Distributed Simulation", by Andreas Tolk (Editor), Old Dominion University. Publisher: John Wiley & Sons.
4. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

### MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-01-03	ADVANCED ENGINEERING MATHEMATICS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students of probability theory, algebra, solutions of Differential equations, Transform techniques, special functions & their applications in the areas with defence relevance.						
Course Outcomes							
CO 1	Students will be able to know the methods for solving differential equations, generating functions.						
CO 2	Students will be able to understand basic concepts of Fourier Transform, Laplace Transforms and solve problems with periodic functions, step functions, impulse functions and convolution.						
CO 3	Students will be able to demonstrate MATLAB programming for engineering problems.						
CO 4	Students will be able to understand the utilization of mathematical methods for solving problems having relevance to defence applications.						

#### Unit I

Elements of Probability and Statistics, components of operations research, Linear Algebra.

#### Unit II

Ordinary Differential equations, Numerical methods for ODE and P.D.E. Generating functions, recurrence relations

#### Unit III

Transform Techniques, Fourier series, Fourier Transform, Laplace Transform

#### Unit IV

Special functions: Power series method, Frobenius method, Legendre equation, Legendre polynomials, Bessel equation, Bessel functions of first kind, Orthogonal property

#### Unit V

Elements of Ramsey theory, theorems of Burnside and Polya, and balanced incomplete block designs

#### Unit VI

Application areas with defence relevance range from mathematics to computer science and operations research, applications in probability, game theory, network design, coding theory, and experimental design

#### Suggested Books:

1. "Advanced engineering mathematics", by Kreyszig. Publisher: Wiley.
2. "Advanced engineering mathematics", by Jain/Iyenger. Publisher: Narosa.
3. "Advanced engineering mathematics", by Taneja. Publisher: I K international
4. "Advanced engineering mathematics", by Alan Jeffery. Publisher: Academic Press.
5. "Advanced engineering mathematics", by Peter V. O'Neil. Publisher: Cengage Learning.
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)**

<b>DT-01-L01</b>	<b>SYSTEMS AND WARFARE PLATFORMS LAB</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>3</b>

**List of Experiments**

Lab experiments will be added in consultation with DRDO labs considering the available facilities

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)**

<b>DT-01-L02</b>	<b>SYSTEMS AND WARFARE PLATFORMS LAB</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>3</b>

**List of Experiments**

Lab experiments will be added in consultation with DRDO labs considering the available facilities

# **Semester 1, Elective-1 Courses**



## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL1-01	ROCKETS & MISSILES FUNDAMENTALS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students about missile system, classification of missiles, aerodynamics of missiles, subsystems and missile trajectory.						
Course Outcomes							
CO 1	Students will be able to understand basics of missile physics as well as the engineering aspects of missile integration.						
CO 2	Students will be able to understand physics behind guided missiles and aerodynamics of missiles.						
CO 3	Students will be able to understand concept of characterization of sub-systems used in missiles.						

### Unit I

Basics of Missile Physics, Introduction to Guided Missiles, Classification of Missiles

### Unit II

Missile Aerodynamic Configurations, Introduction to Missile System, Interrelationship between various Missile Sub-Systems

### Unit III

Basic Characteristics of Guided Missile Systems, Missile System Reliability, Range dispersion and CEP Concept

### Unit IV

Design, System Layout and integration of Sub-Systems

### Unit V

Coordinate Transformation, Transformation Matrices. Two, Three and Six DOF Equations of Motion, Ballistic Missile Trajectory

### Unit VI

Effect of Curvature of Earth, Rotation of Earth, Variation of Gravity on Missile Trajectory

### Suggested Books:

1. "Fundamentals of Guided Missiles", by S. R. Mohan. Publisher: Defence Research and Development Organization.
2. "Estimation and Prediction of Ballistic Missile Trajectories" by Jeffrey A. Isaacson, David R. Vaughan. Publisher: RAND (29 May 1996)
3. "Introduction to Modern Algebra and Matrix Theory", by O. Schreier, E. Sperner, Martin David, Melvin Hausner. Publisher: Dover Publications.
4. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.** The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL1-02	ADVANCED THERMAL ENGINEERING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students for the thermal management requirements / problems of the defence systems and thermal system design & simulation for the various air, land & naval defence systems utilized under different environmental conditions						
Course Outcomes							
CO 1	Students will be able to understand thermal design and simulations for system design.						
CO 2	Students will be able to carry out CFD simulations, design of heat exchangers, refrigeration.						
CO 3	Students will be able to the concept of thermal management requirement & design for defence systems.						

### Unit I

System thermal design & Analysis, Tools for thermal design and simulation, Heat transfer analysis (conduction, convection & radiation),

### Unit II

Computation fluid dynamics (CFD), Thermal Finite Element Analysis

### Unit III

Heat Exchangers for: Heat Exchanger Network Design

### Unit IV

Refrigeration, Humidifiers, Air Washers and Cooling Towers

### Unit V

Thermal management design of defence system (combat vehicles, missiles, aerial vehicles etc.)

### Unit VI

Thermal testing, thermal operation, and integration of thermal design into the defence systems

### Suggested Books:

1. "Fundamentals of Heat and Mass Transfer", by Incropera and Dewitt. Publication: John Wiley.
2. "Convective Heat and Mass Transfer", by W M Kays and M E Crawford. Publisher: McGraw-Hill publishing Company.
3. "Thermal Radiation Heat Transfer" by J Siegel and R Howell. Publisher: Elsevier.
4. "Manohar Prasad, Refrigeration and Air Conditioning", 3rd Edition, New Age International, 2015.
5. "Computational Fluid Dynamics – The Basics with Applications", by John D Anderson. Publisher :1st Edition, McGraw Hill, 2012.
6. "Thermal System Design and Simulation", by P.L. Dhar, 1st Edition.
7. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL1-03	NUMERICAL METHODS FOR SCIENCE AND ENGINEERING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students to develop numerical methods aided by technology to solve algebraic equations, calculate derivatives and integrals, curve fitting and optimization techniques. The course will also develop an understanding of the finite element analysis and computational fluid engineering.						
Course Outcomes							
CO 1	Students will be able to Use the numerical techniques (algorithms) to find the solution (approximate) algebraic equations and system of equations.						
CO 2	Students will be able to fit the data using interpolation technique and spline methods.						
CO 3	Students will be able to use finite element analysis, interpretation of analysis results. They will be able to understand computational engineering process						

### Unit I

Introduction, solution of non-linear equations, solution of linear systems

### Unit II

Introduction and polynomial approximation, curve fitting, Numerical applications & intergradations, numerical optimization

### Unit III

Matrices and types of linear systems, direct elimination methods, conditioning and stability of solutions

### Unit IV

Introduction to Finite Element Analysis (FEA) simulation software, Pre- and Post-Processing, Free mesh and Mapped mesh techniques, Quality checks on nodes and elements, Boundary conditions

### Unit V

Introduction to computational fluid engineering, Fundamental equations, Computational Engineering Process

### Unit VI

Fluid Simulation for Computer Graphics, Modelling techniques

### Suggested Books:

1. "Numerical Methods for Scientific and Engineering Computation", by M. K. Jain and S.R.K. Iyengar. Publisher : New Age International Publishers.
2. "Applied Numerical Analysis", by Gerald & Wheatley. Publisher Addison – Wesley.
3. "Introductory Methods of Numerical Analysis", by, S.S. Sastry. Publisher: PHI Pvt. Ltd., 5<sup>th</sup> Edition, New Delhi, 2009.
4. "Applied Numerical Methods Using MATLAB", by W.Y. Yang, W. Cao, T.S. Chung and J. Morris. Publisher: Wiley India Edn., 2007.
5. "Numerical Methods for Engineers with Programming and Software Applications", by Steven C. Chapra and Ra P. Canale. Publisher: Tata McGraw Hill, 2014 7<sup>th</sup> Edition.
6. "Finite Element Procedures", by K.J. Bathe, Prentice Hall of India.

7. "Finite Elements in Engineering", by Chandrupatla and Belegundu.
8. "Finite element Method", by J.N.Reddy.
9. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL1-04	COMMUNICATION TECHNOLOGY						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students about communication system design, calculation of bandwidth and signal-to-noise ratio of a signal, digital communication systems, performance evaluation, explain the concepts of link budget and multiple accesses as it applies to wireless communication.						
Course Outcomes							
CO 1	Students will be able to understand communication system design methodologies, communication system architecture, analogue & digital modulation techniques.						
CO 2	Students will be able to do computation of data rates, bandwidth, BER.						
CO 3	Students will be able to carry out the link budget analysis						

### Unit I

Introduction on Communication Systems, Basics of wireless channel behaviour

### Unit II

Digital data communication systems, digital signalling techniques

### Unit III

Data rates and bandwidth calculation in digital data communication systems

### Unit IV

Probability of error and BER calculation, Modulation technologies (analogue & digital), Voice source coding, transmitter and receiver systems

### Unit V

Communication system architectures, terminal design and performance, associated information systems

### Unit VI

Link budget calculations, telemetry and control and IO/IW implications. Antenna types and their impact on the communication systems

### Suggested Books:

1. "Fundamentals of communication systems," by Proakis and Salehi. Publisher: Pearson.
2. "Communication Systems", by Simon Haykin and Michael Moher. Publisher: Wiley.
3. "Modern digital and analog communication systems," by B.P. Lathi and Zhi Ding. Publisher: Oxford University Press.
4. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL1-05	ADVANCED MECHANICAL ENGINEERING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students about different methods of mechanical system analysis, mechanical simulation soft-ware and use of computational techniques for structural and fluid dynamics.						
Course Outcomes							
CO 1	Students will be able to understand mechanical analysis software and carry out mathematical modeling for simulation of phenomena behind the structural and fluid dynamics.						
CO 2	Students will be able to carry out design & finite element analysis of components of systems and sub-systems.						
CO 3	Students will be able to carry out the CFD analysis						

### Unit I

Introduction to tools for mechanical design & analysis

### Unit II

Stress engineering – theory & simulation, mechanics of solids

### Unit III

Finite element methods in structural dynamics, Structural integrity

### Unit IV

Fluid mechanics

### Unit V

Computational fluid dynamics

### Unit VI

Component design, Applied materials and corrosion

### Suggested Books:

1. "An Introduction to Computational Fluid Dynamics: The Finite Volume Method " by H. Versteeg. Publisher: Pearson.
2. "Computational Fluid Dynamics the Basics with Applications", by John D. An-der Jr. Publisher: McGraw Hill Education (1 July 2017)
3. "Fluid Mechanics: Volume 2: Foundations and Applications of Mechanics (Cambridge-iisc)" by C.S. Jog. Publisher: Cambridge University Press.
4. "Fundamentals of Machine Component Design", by Robert C. Juvinall, Kurt M. Marshek. Publisher: John Wiley & Sons
5. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

# **Semester 1, Elective-2 Courses**



## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL2-01	AUTONOMY AND NAVIGATION TECHNOLOGY						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students about technology of modern navigation systems, particularly satellite-based systems, UAV guidance systems, GPS, SLAM.						
Course Outcomes							
CO 1	Students will be able to describe the basic principle of operation of a global navigation satellite system.						
CO 2	Students will be able to understand the navigation systems and derive the navigation equations.						
CO 3	Students will be able to carry out path planning the UGV / UAV						
CO 4	Students will be able to solve the equations for calculating a position estimate from a given satellite constellation.						

### Unit I

Introduction on navigation and guidance systems, Guidance approaches: conventional guidance such as PN (Proportional Navigation)

### Unit II

Geodetic fundamentals of navigation, positioning, reference- and coordinate systems and computational methods for navigation and positioning on the surface of the earth

### Unit III

Geometric guidance, path planning and following, and optimal guidance; path planning for UGV/UAV guidance systems

### Unit IV

Navigation approaches: navigation systems, Understanding the Global Positioning System (GPS)

### Unit V

GNSS (Global Navigation Satellite System), terrain-based navigation

### Unit VI

SLAM (Simultaneous Localization and Mapping); Cooperative guidance and collision avoidance

### Suggested Books:

1. "Global Navigation Satellite Systems: Insights Into GPS", by Bhatta, B., Glonass, Galileo, Compass, and Others. Publisher: BS Publications, New Delhi 2010.
2. "Global Positioning Systems, Inertial Navigation, and Integration", by Grewal, M. S., Weill, L. R., Andrews, A. P., Publisher: John Wiley & Sons, New York, 2006.
3. "GNSS – Global Navigation Satellite Systems", by Verlag Wien. Hofmann-Wellenhof, B., Lichtenegger, H., Wasle, E.. Publisher: Springer 2008.
4. "Global Positioning System Theory and Practice", Hofmann-Wellenhof, B., Lichtenegger, H., Verlag Wien, Collins, J. Publisher: Springer 2001.
5. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL2-02	OPTIMIZATION THEORY & APPLICATIONS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students on the numerical optimization algorithms. The course objective is to cover the concepts of optimization methods and algorithms developed for solving various types of optimization problems. Apply the mathematical results and numerical techniques of optimization theory to various Engineering and Analytics problems and applications in both theoretical and applied research areas.						
Course Outcomes							
CO 1	Students will be able to understand mathematical modeling and the formulation of optimization problems.						
CO 2	Students will be able to create programs based on different optimization algorithms using IT tools, such as MATLAB etc.						
CO 3	Students will be able to understand theory about linear programming, integer programming, and stochastic programming						
CO 4	Students will be able to understand the process of finalizing design of engineering systems by applying the numerical optimization.						

### Unit I

Introduction to optimization, classical optimization techniques

### Unit II

Linear programming & nonlinear programming and dimensional minimization methods

### Unit III

Non coordination optimization techniques, coordinated optimization techniques, coordinated programming

### Unit IV

Dynamic programming, integer programming, stochastic programming

### Unit V

Solution of a variety of design problems in mechanical engineering, using numerical optimization techniques

### Unit VI

Additional Topics: multi-objective, optimization, game theory, optimal control theory

### Suggested Books:

1. "Numerical Optimization", by Jorge Nocedal and Stephen J. Wright. Publisher: Springer, 2006.
2. "Practical methods of Optimization" by R. Fletcher. Publisher: Wiley, 1987.
3. "Iterative method for optimization" by C. T. Kelley. Publisher: SIAM, 1999.
4. "Introduction to Nonlinear Optimization: Theory, Algorithm, and Application with MATLAB. MOSSIAM Series on Optimization", by Amir Becker.
5. "Dynamic Programming and Optimal Control (Volume I)" by Dimitri P. Bertsekas. Publisher: Athena Scientific, 2005.
6. "Optimization Theory and Applications", by S.S. Rao.
7. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL2-03	MILITARY ELECTRONICS SYSTEM ENGINEERING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students about the learning of the electronics systems requirement for military environment, generation of system requirements, limitations of COTS equipment and radiation effects on the electronic systems.						
Course Outcomes							
CO 1	Students will be able to understand the military electronics systems.						
CO 2	Students will be able to generate system design requirements as per mission needs & operational requirements.						
CO 3	Students will be able to create digital simulation models						
CO 4	Students will be able to understand the limitations of the COTS available electronics systems.						
CO 5	Students will be able to evaluate the radiation effects on the performance of electronics systems						

### Unit I

Introduction to electronics engineering concepts and methods for the design and integration of complex defense systems

### Unit II

Familiarity with the systems engineering process through case studies of representative defense systems

### Unit III

Introduction to methods used for determination of system requirements from mission needs and operational requirements

### Unit IV

Digital simulation models, including those in current used in defence for determining engineering and performance trade-offs

### Unit V

Limitations of commercial-off-the-shelf (COTS) integrated circuits, thermal failure, electrostatic breakdown, noise in solid state devices, packaging reliability issues

### Unit VI

Radiation effects due to space and nuclear environments, and the limited availability of military integrated circuit suppliers

### Suggested Books:

1. "Introduction to Electronic Defense Systems", by Neri Filippo. Publisher: Artech House Publishers.
2. "Military Handbook of Electronic Reliability design", by US Department of Defence.
3. "Defence Electronics Standards and Quality Assurance", by Ray Tricker. Publisher : Elsevier
4. "Handbook of Defence Electronics and Optronics: Fundamentals, Technologies and Systems", by Anil K. Maini. Publisher: John Wiley & Sons Ltd

5. "Digital Simulation Methods", by M.G. Hartley. Publisher: P. Peregrinus Ltd
6. "Analysis and Simulation of Noise in Nonlinear Electronic Circuits and Systems", By Alper Demir. Publisher: Springer.
7. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (1<sup>ST</sup> Sem.)

DT-EL2-04	SYSTEM ENGINEERING AND ANALYSIS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge to the students about the military systems engineering, system requirements, basics of system design, architecture, operational requirements, system reliability and management.						
Course Outcomes							
CO 1	Students will be able to understand the system design requirements, architecture, functional requirements.						
CO 2	Students will be able to generate the system requirements documents as per the requirement analysis.						
CO 3	Students will be able to understand the system reliability, maintainability, usability issues						
CO 4	Students will be able to carry out the system reliability analysis.						

### Unit I

Fundamentals of systems engineering and system architecting of weapon system, system Engg. standards 15288, requirements analysis, functional analysis and allocation, preliminary system architecture

### Unit II

Systems analysis, system design, and the basics of test and evaluation, Introduction to combat systems

### Unit III

System development phases (Conceiving, Designing, Implementing, and Operating)

### Unit IV

Techniques of system design and assessment for operational feasibility, including reliability, maintainability, usability (including human factors and human performance).

### Unit V

Supportability, and producibility, System cost assessment and effectiveness estimation

### Unit VI

Reliability analysis and management (basic tools and methods of reliability for developing complex systems including electronic components, mechanical components, and software), redundancy, graceful degradation, fault tolerance, MTBF

### Suggested Books:

1. "The Engineering Design of Systems: Models and Methods", by Buede D.M.2. Publisher: John Wiley & Sons Inc.
2. "Systems engineering fundamentals", by Defense Acquisition University Pressfort Belvoir, Virginia
3. "System Analysis Design and Development", by Charles S. Wasson. Publisher : Wiley Series in System Engineering and Management.
4. "Principles of Planned Maintenance", by Clifton R H. Publisher: McGraw Hill, New York.
5. "An introduction to Reliability and Maintainability Engineering", by Ebling CE. Tata Mc Graw Hill.

6. "Reliability Engineering", by Srinath L S. Publisher: Affiliated East-West Press Limited, New Delhi, 2002.
7. "Engineering Maintainability", by Dhillon B S. Publisher: Prentice Hall of India.
8. Literature / Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***



# Semester -II

**MASTER OF TECHNOLOGY  
IN  
DEFENCE TECHNOLOGY (w. e. f. 2021-22)  
SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS							
DT-CSS-01	RADAR TECHNOLOGIES						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students learning on the radar systems, radar parameters, radar environment, theory of detection and design of radar elements, different types of radars & their application.						
Course Outcomes							
CO 1	Students will be able to understand the design of radar systems, solve range equations.						
CO 2	Students will be able to Apply appropriate mathematical and computer models relevant to radar systems to calculate system performance and assess the limitations of particular cases.						
CO 3	Students will be able to understand the major components of a modern radar system						
CO 4	Students will be able to learn basic radar signal processing techniques and understand advanced radar techniques.						
CO 5	Students will be able to know the major functions and applications of a modern radar systems.						

**Unit I**

Introduction to RADAR, Radar parameters/definitions, radar equations

**Unit II**

Radar cross section (RCS) & Theory of detection, Clutter

**Unit III**

Atmospheric propagation, Surveillance and Tracking Radar, Radar Designs

**Unit IV**

Radar elements Design, Radar Transmitter design, Radar antenna design, Duplexer/TR switch & Radar Receiver.

**Unit V**

Radar signals and networks, Radar signal processing chain, Pulse compression and micro-doppler processing, Tracking algorithms

**Unit VI**

Phased array radar, Data processing for phased array radar, Airborne radar, imaging radar, Synthetic aperture radar, inverse synthetic aperture radar, adaptive array processing

**Suggested Books:**

1. "Introduction to Radar Systems" by M.I. Skolnik. Publisher: Tata McGraw hill edition, 2001.
2. "Radar Systems Analysis and Design using MATLAB", by B.R. Mahafza. Publisher CRC Press, 2013.
3. "Monopulse Principles and Techniques", by S.M. sherman and D.K. Barton. Publisher: Artech house, 2011
4. "Fundamentals of Radar Signal Processing", by M.A. Richards. Publisher Tata McGraw hill.
5. "Ground Penetrating Radar: Theory and Applications", by, Editor: H.M. Jolt. Publisher: Elsevier.

6. "Radar, Sonar And Navigation Engineering", by K. K Sharma. Publisher: S K Kataria & Sons.
7. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS							
DT-CSS-02	DIGITAL & SATELLITE COMMUNICATION AND NAVIGATION FROM SPACE						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students learning on the analogue and digital communication systems, optical communication, satellite communications systems, modulations techniques, signal propagation effects, navigation techniques.						
Course Outcomes							
CO 1	Students will be able to understand the communication techniques.						
CO 2	Students will be able to evaluate the performance of communication systems.						
CO 3	Students will be able to design the analogue and digital communication systems						
CO 4	Students will be able to understand and analyse the signal transmission effects.						
CO 5	Students will be able understand the different types of navigation techniques.						

**Unit I**

Elements of a communications system and their relationship to system performance

**Unit II**

Free space optical communication, Fiber optics communication, Wireless/cellular communications

**Unit III**

Fundamental concepts such as current/voltage relationships, time and frequency domains, power spectral density, random signals, Communications system components and functions, analog and digital communications systems

**Unit IV**

Modulation transmission and reception; baseband and passband digital modulation; system, noise, transmission lines, waveguides and antennas, FEC techniques for mitigating channel errors.

**Unit V**

Propagation effects on signal transmission; end-to-end path calculations for wire/coax, and RF systems including terrestrial ground links and satellite communications, Spread spectrum, concept of frequency hopping

**Unit VI**

Navigation techniques from space regarding functioning of GPS, GLONASS, IRNSS & Galileo

**Suggested Books:**

1. "Satellite communication", by T. Pratt, C. W. Bostian, J. E. Allnut. Publisher: John Willey and sons
2. "Satellite Communications Systems: systems, techniques and technology", by G. Maral, M. Bousquet, Z. Sun. Publisher: John Willy and sons
3. "Digital Communications: Fundamentals and Applications", B. Sklar . Prentice-Hall, Inc.

4. "Understanding of GPS/GNSS: Principles and Applications", by E. Kaplan and C. Hegarty.  
Publisher: Artech House Publishers.
5. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS							
DT-CSS-03	TACTICAL BATTLEFIELD COMMUNICATION & ELECTRONIC WARFARE						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students learning on the techniques for setting up intercept and jamming links for Electronic Warfare (EW) against ground to ground enemy communication signals, UAV command and data links, cell phone links and weapon control links, techniques for predicting intercept and jamming performance.						
Course Outcomes							
CO 1	Students will be able to understand the nature of tactical battlefield communication.						
CO 2	Students will be able to calculate communication link performance.						
CO 3	Students will be able to calculate the requirements for interception of tactical communication						
CO 4	Students will be able to Calculate the requirements for emitter location, intercept and jamming of tactical comm, signals including weapon control link, UAV links, Cell phone links.						
CO 5	Students will be able to use various tools to perform electronic warfare calculations.						

**Unit I**

Radiometry and power calculation, signature generation, atmospheric effects

**Unit II**

Radar ES operational use, radar/ES detection battle, quiet radar, jamming techniques & strategies, jamming of SAR systems

**Unit III**

Introduction to radar waveform interception, Technology and operational characteristics of electronic warfare, Signal processing statics & analysis, statistics & noise, analogue & digital signal processing

**Unit IV**

Decision theory- hypothesis testing, probabilities of false alarm and detection, Bayesian systems, error probability and bit error rate, receiver operating.

**Unit V**

UAV Payload/link Issues, cell phone issues, Intercept links, Frequency hopping and other LPI threats; Special techniques for jamming LPI signals

**Unit VI**

Introduction to electronic counter measures and counter-counter measures

**Suggested Books:**

1. "Tactical Battlefield Communications Electronic Warfare", by David Adamy 2008
2. "Military Communications in the Future Battlefield", by Marko Suojanen.
3. "Electronic Warfare for the Digitized Battlefield", by Michael Frater, Michael Ryan.
4. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

<b>DT-CSS-L01</b>	<b>RADAR TECHNOLOGIES LAB</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>3</b>

**List of Experiments**

Lab experiments will be added in consultation with DRDO labs considering the available facilities



**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

<b>DT-CSS-L02</b>	<b>DIGITAL &amp; SATELLITE COMMUNICATION AND NAVIGATION FROM SPACE LAB</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>3</b>

**List of Experiments**

Lab experiments will be added in consultation with DRDO labs considering the available facilities

# Semester -II

**MASTER OF TECHNOLOGY  
IN  
DEFENCE TECHNOLOGY (w. e. f. 2021-22)  
SPECIALIZATION: DIRECTED ENERGY TECHNOLOGY**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: DIRECTED ENERGY TECHNOLOGY**

SPECIFICATION: DIRECTED ENERGY TECHNOLOGY							
DT-DET-01	DIRECTED ENERGY SOURCES (LASERS, MICROWAVE)						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students on the high-power laser sources, laser power scaling methodologies, laser beam characterization, optics requirements for high power lasers and generation of high power microwave sources.						
Course Outcomes							
CO 1	Students will be able to understand high power lasers sources, power scaling methodologies of lasers.						
CO 2	Students will be able to carry out the atmospheric effects on high power laser beam propagation.						
CO 3	Students will be able to estimate optics requirement for handling high power laser beams						
CO 4	Students will be able understand generation and testing of high-power microwave sources.						

**Unit I**

Introduction of directed energy weapons, Potential weapon applications, how they work, application scenarios

**Unit II**

High power laser sources (solid state, fiber, free election, liquid etc.), Laser power scaling

**Unit III**

Atmospheric Laser Beam propagation

**Unit IV**

Characterization of laser beam parameters

**Unit V**

Optical material & coating for high energy lasers

**Unit VI**

High power microwave sources, HPM effects, testing of HPM sources

**Suggested Books:**

1. "High Power Laser Handbook, by Hagop Injeyan & Gregory D. Goodno
2. "High Power Microwaves James Benford", by John A. Swegle, Edl Schamiloglu.
3. "Coherent Laser Beam Combining", by Arnaud Brignon.
4. "High-Power Optics Lasers and Applications", by Apollonov, Victor V.
5. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**

**SPECIALIZATION: DIRECTED ENERGY TECHNOLOGY**

DT-DET-02	BEAM CONTROL TECHNOLOGY, TARGET ACQUISITION, BEAM POINTING & TRACKING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to the students about high power laser & microwave beam control technologies, laser beam directors, their operational requirements, design procedure, design criticality, active target imaging & target tracking, recent developments in the target tracking, atmospheric effects on laser propagation, mitigation methodologies and adaptive optics.						
Course Outcomes							
CO 1	Students will be able to understand of high-power laser & microwave beam directors, design requirements & design methodologies.						
CO 2	Students will be able to gain knowledge of active target imaging, coarse & fine target tracking and contemporary target tracking technologies.						
CO 3	Students will be able to compute atmospheric effects on the laser beam performance and hence carry out conceptual design of adaptive optics						

**Unit I**

Introduction to beam control, Beam control hardware

**Unit II**

Introduction to laser beam directors, Requirement for high power laser beam directors, Conceptual optical design & analysis of beam Directors

**Unit III**

Laser beam tracking, pointing & control, Gimbals, Coarse & fine tracking

**Unit IV**

Active laser imaging & target tracking, Closed loop image tracking, Hardware requirement, Various tracking algorithms, multi-spectral target imaging, Multiple target engagements, rapid retargeting.

**Unit V**

Atmospheric propagation of Laser beams, atmospheric propagation of laser beams, Correction of atmospheric effects, Adaptive optics, Atmospheric modeling of laser propagation

**Unit VI**

Introduction to HPM beam control technology, major sub-assemblies

**Suggested Books:**

1. "Beam Control for Laser Systems", by Paul Merritt.
2. "Principles of Adaptive Optics", by Robert Tyson.
3. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.** The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: DIRECTED ENERGY TECHNOLOGY**

SPECIALIZATION: DIRECTED ENERGY TECHNOLOGY							
DT-DET-03	DIRECTED ENERGY WEAPON (DEW) SYSTEM ENGINEERING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
4	0	0	4	60	40	100	3
Objective	To provide knowledge to students about Directed Energy Weapon subsystems, systems. They will also gain knowledge about system design & analysis, thermal management & power management of DEW and the operational requirements. The course will also provide an insight about the DEW systems developed internationally.						
Course Outcomes							
CO 1	Students will be able to understand of DEW systems, design requirements.						
CO 2	Students will be able to evaluate the thermal and power requirements.						
CO 3	Students will be able to Evaluate the system performance.						

**Unit I**

Attributes of DEW, System requirements, DEW system design, system analysis

**Unit II**

DEW subsystems, System modeling & simulation

**Unit III**

Thermal management of DEW, Power management of DEW

**Unit IV**

Operational requirements of directed energy systems, platform integration.

**Unit V**

Weapon effectiveness under different operating conditions

**Unit VI**

Overview of internationally developed systems (Airborne Laser Laboratory, Airborne Laser, Tactical High Energy Laser, Advanced Tactical Laser, and Space-Based Laser programs)

**Suggested Books:**

1. "Directed-Energy Beam Weapons Hardcover", by Bahman Zohuri.
2. "Directed Energy Weapons: Physics of High Energy Lasers (HEL)", by Bahman Zohuri.
3. "An Introduction to Laser Weapon Systems", by Glen P. Perram.
4. "Effects of Directed Energy Weapons", by Philip Nielsen.
5. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

<b>DT-DET-L01</b>	<b>DIRECTED ENERGY LASER SOURCES LAB</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>3</b>

**List of Experiments**

1. Optical resonator design and experimental evaluation
  2. Optics Alignment using He-Ne laser
  3. Measurement of Laser Power, Beam Width, Spatial Profile, Wavelength
  4. Measurement of Laser Beam Parameter (M2)
  5. Optics Surface Quality test using Interferometer
  6. Optical Coating Reflectivity, Transmission Test
  7. Characterization of Microwave sources
- More experiments may be planned in discussion with the concern DRDO Lab.

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>ND</sup> Sem.)**  
**SPECIALIZATION: COMMUNICATION SYSTEMS & SENSORS**

<b>DT-DET-L02</b>	<b>BEAM CONTROL TECHNOLOGY, TARGET ACQUISITION, BEAM POINTING AND TRACKING LAB</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>60</b>	<b>40</b>	<b>100</b>	<b>3</b>

**List of Experiments**

Lab experiments will be added in consultation with DRDO labs considering the available facilities

# **Semester 2, Elective-III Courses (For All Specializations)**



### MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL3-01	ROBOTICS (MSS, MCC)						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the basic concepts of robotics by exposing students to a broad range of topics with emphasis on basics of manipulators, coordinate transformation and kinematics, trajectory planning, control techniques, sensors and devices, robot applications and economics analysis.						
Course Outcomes							
CO 1	Students will be able to use matrix algebra and Lie algebra for computing the kinematics of robots.						
CO 2	Students will be able to calculate the forward kinematics and inverse kinematics of serial and parallel robots.						
CO 3	Students will be able to calculate the Jacobian for serial and parallel robot.						
CO 4	Students will be able to do the path planning for a robotic system.						
CO 5	Students will be able to use software tools for analysis and design of robotic systems.						

#### Unit I

Fundamentals of land-based robotic systems covering the areas of locomotion, manipulation, grasping, sensory perception, and teleoperation

#### Unit II

Kinematics, dynamics, manipulability, motion/force control, real-time programming, controller architecture, motion planning, navigation, and sensor integration, Control system design

#### Unit III

Transformation of coordinates, Kinematics and inverse kinematics, Jacobians

#### Unit IV

Modelling Control, Proportional (P), Proportional-Integral (PI), Proportional-Integral-Derivative (PID) and Model Based Predictive Controller (MPC)

#### Unit V

Feedback Control System, Motion and path planning, Collision avoidance and navigation

#### Unit VI

Fundamental of AI, Programming methods for robotics, Human-Robot interaction

#### Suggested Books:

1. Textbook: Introduction to Robotics by S.K. Saha (Tata McGraw-Hill, New Delhi, India 2008, 1<sup>st</sup> Reprint 2009)
2. "Introduction to Robotics: Mechanics and Control", by Craig, J.J. Publisher: Pearson, Delhi.
3. "Fundamentals of Robotics: Analysis and Control", by Schilling Robert J. Publisher : Prentice-Hall, 1990.

4. "An Introduction to Robotics Analysis, Systems, Applications", by Niku Saeed B. Publisher: Prentice-Hall, 2001.
5. Stuart Russell and Peter Norvig, Publisher: Prentice Hall
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

### MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL3-02	EMI/EMC IN MILITARY SYSTEMS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the basic concepts of EMI/EMC design, techniques for prevention of electronic equipment through good EMI/EMC design techniques – grounding, shielding, cable management, and power interface design, troubleshooting techniques, EMI/EMC standards.						
Course Outcomes							
CO 1	Students will be able to understand the concept of EMI / EMC protection of equipment.						
CO 2	Students will be able to Identify and prevent the common EMI/EMC problems in military systems.						
CO 3	Students will be able to understand the Design impact (by requirement) of military EMC specifications.						
CO 4	Students will be able to understand EMI/EMC troubleshooting tips and techniques.						
CO 5	Students will be able to learn generate EMI/EMC requirements document.						

#### Unit I

Basic Concepts: Definition of EMI/EMC and EMP, Classification of EMI/EMC, Sources of EMI, EMI coupling modes, ESD Phenomena and effects, Transient phenomena and suppression

#### Unit II

MC requirements for electronic systems, Non-ideal Behaviours of Components; EMI Measurements: Basic principles of EMI measurements, EMI measuring instruments

#### Unit III

EMI Control Methods: Conducted and radiated emissions and susceptibility, Crosstalk and shielding, Grounding, Bonding, Filtering, EMI gasket, Isolation transformer, opto isolator; Faraday cage, isolation of shelters

#### Unit IV

EMC Standard and Regulations: National and International standardizing organizations, Frequency assignment, Spectrum conversation

#### Unit V

EMC Design and Interconnection Techniques: Cable routing and connection, Component selection and mounting, PCB design (Trace routing, Impedance control, decoupling, Zoning and grounding)

#### Unit VI

EMC analysis and detection techniques: Using tools for signal integrity analysis, Study eye diagrams for communication systems

#### Suggested Books:

1. "EMI/EMC Computational Modeling Handbook", by brucearchambeault, Omar M. Ramahi, et al.

2. "EMI/EMC Computational Modeling Handbook: 630 (The Springer International Series in Engineering and Computer Science)", by Bruce R. Archambeault, Omar M. Ramahi, et al.
3. "A practical approach to electromagnetic compatibility", by Chetan Kathalay
4. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-03	DEFENCE ELECTRO-OPTICS AND IMAGING SYSTEMS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To introduce the principles of wide range of current and future electro-optic and imaging devices. Course will also enable students to light on application of electro optics and imaging system in defence application.						
Course Outcomes							
CO 1	Students will be able to understand the technology and principles underpinning electro-optic devices and systems.						
CO 2	Students will be able to apply their knowledge to practical electro-optic design and acquisition problems.						
CO 3	Students will be able to understand the trade-offs in electro-optic systems design.						

**Unit I**

Principles of radiometry, The human eye, Visible band optical sighting systems

**Unit II**

Camera systems, Image intensifiers, Missile seekers

**Unit III**

Electro-optic countermeasures

**Unit IV**

Thermal imagers, II cameras, Hyper-spectral imaging, Digital image processing

**Unit V**

EO sensors for Lasers and laser DEW

**Unit VI**

Electro-optic protection measures

**Suggested Books:**

1. "Systems engineering analysis of electro-optical and Infra red system", by William Wolfgang Arrasmith.
2. "Introduction to Infrared and Electro-Optical Systems", by Author Ronald G. Driggers Ronald G. Driggers.
3. "Handbook of Defence Electronics and Optronics: Fundamentals, Technologies and Systems", by Author(s): Anil K. Maini
4. "Building Electro-Optical Systems: Making It all Work", by Author Philip C. D. Hobbs.
5. "Electro-Optical Instrumentation: Sensing and Measuring with Lasers", by Author Silvano Donati.
6. "Electro-optical systems design, Analysis and testing", by Author Michael C. Dudzik.
7. Literature / books suggested by respective course Lecturers..

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-04	STRUCTURAL DYNAMICS AND AERO-ELASTICITY						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the mathematics behind the computational analysis, Different methods of analysis, Mathematical modeling of the various phenomena related to vibration analysis, various failure criteria and theory related to elastic fracture						
Course Outcomes							
CO 1	Students will be able to understand vibrations and fluid dynamics behind the aerospace system.						
CO 2	Students will be able to understand of different design aspects related to loading in aerospace system.						
CO 3	Students will be able to do the system dynamic analysis using finite element methods.						

**Unit I**

Principles and methods of computational structural dynamics and vibration analysis

**Unit II**

Introduction to dynamic analysis using the finite element method, Calculation of modal parameters

**Unit III**

System dynamic response via mode superposition, frequency response, model reduction, and structural synthesis techniques, Fatigue analysis

**Unit IV**

Introduction to aero-elasticity, Aerodynamic Loading, Bending Moment, Sectional properties of Aerofoil, V-n Diagram

**Unit V**

Basic theory of linear elastic fracture mechanics; strain energy release rate

**Unit VI**

Applications to delamination crack growth in polymer composite laminates, Damage tolerance issues in composites

**Suggested Books:**

1. "Elements of vibration analysis", by Leonard Meirovitch. Publisher : McGraw-Hill Inc.,US; 2<sup>nd</sup> edition (1 March 1986)
2. "Finite Element Analysis Theory And Application With ANSYS", by Moaveni Publisher : Pearson Education; 3rd edition (1 January 2011)
3. "Mechanical Vibrations | SI Edition | Sixth Edition", by Singiresu S. Rao. Publisher: Pearson

4. "Elements of Fracture Mechanics", by Prashant Kumar. Publisher : McGraw Hill Education.
5. "Introduction to Structural Dynamics and Aeroelasticity", by Dewey H. Hodges and G. Alvin Pierce. Publisher: Cambridge University Press.
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***



**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-05	SAFETY, HEALTH & HAZARD MANAGEMENT						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To inculcate a holistic approach towards safety health and hazard management. The course will provide understanding on the safety & hazard management of the toxic chemicals, gases, explosives etc.						
Course Outcomes							
CO 1	Students will be able to understand chemical safety standards, fire safety, hazard management.						
CO 2	Students will be able to handle toxic liquids & gases, explosives.						
CO 3	Students will be able to understand the NBC warfare safety, health & environment safety.						

**Unit I**

Chemical Safety: Standards and regulations of chemical safety in Industries or Laboratories, Storage of hazardous chemicals, Compatibility and classification codes, Chemical risk analysis and management

**Unit II**

Fire triangle and Handling of Toxic, Industrial Gases

**Unit III**

Hazard Management: HAZOP and HAZAN techniques, Hazard in manufacture, Hazard prevention measures, Disposal of hazardous materials

**Unit IV**

Warfare: Classifications of explosives based on hazards, Nuclear, biological and chemical warfare safety

**Unit V**

Health: Assessment of human factors, Health & Environment safety

**Unit VI**

Nano materials safety (Toxicology study)

**Suggested Books:**

1. "Occupational Health and Safety Management A Practical Approach", by Charles D. Reese. Publisher: CRC Press.
2. "Occupational and Environmental Safety and Health", Arezes, P.M., Baptista, J.S., Barroso, M.P., Carneiro, P., Cordeiro, P., Costa, N., Melo, R.B., Abreu dos Santos Baptista, J.M., Perestrelo, G. (Eds.). Publisher: Springer, 2019
3. "Handbook of Occupational Safety and Health", by S. Z. Mansdorf. Publisher: Wiley.
4. "Institution of Chemical Engineers", by Trevor Kletz Hazop and Hazan

5. "Handbook Of Toxicology Of Chemical Warfare Agents", by Ramesh C. Gupta 2nd Edition Elsevier, 2015
6. "Nanomaterials Safety Toxicity And Health Hazards", by Shyamasree Ghosh De Gruyter.
7. "Hazardous Chemicals Handbook", by Phillip Carson, Clive Mumford Butterworth-Heinemann.
8. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL3-06	FUNDAMENTAL OF TELEMETRY, TELECOMMAND& TRANSPONDER						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge of the students about the satellite communication, telemetry, modulation techniques, target tracking, signal processing of communication systems						
Course Outcomes							
CO 1	Students will be able to understand Satellite communication and related technologies.						
CO 2	Students will be able to under concept of overall control of satellites through collection, processing, and transmission of data.						
CO 3	Students will be able to understand the concept of determination of the satellite’s exact location through the reception, processing, and transmitting of ranging signals.						
CO 3	Students will be able to understand the concept of proper control of satellite through the reception, processing, and implementation of commands transmitted from the ground						

### Unit I

Fundamental of satellite communication, different modulation and multiplexing Schemes

### Unit II

Satellite Telemetry, Tracking and Tele-command, Multiple Access Techniques Telemetry, Data Transmission, Methods of Modulation, Time Division and Frequency Division Multiplexing, FDMA, TDMA, CDMA and DAMA, Coding Schemes

### Unit III

Satellite Packet Communications, Tracking and Telemetry

### Unit IV

Doppler and Electro-Optical methods of tracking, Airborne Missile

### Unit V

Signal Processing: Processing of Signal, Data Acquisition and Reduction

### Unit VI

Introduction to satellite communication, transponders

### Suggested Books:

1. "Spacecraft TT&C and Information Transmission Theory and Technologies", by, Jiaxing Liu. Publisher: Springer, 2014
2. "Introduction to PCM Telemetering Systems", by Stephen Horan. Publisher: CRC Press
3. "Satellite Communications Systems: Systems, Techniques and Technology", by Gerard Maral, Michel Bousquet, Zhili Sun. Publisher : Wiley, 2020
4. "Satellite Communications", by Timothy Pratt, Jeremy E. Allnutt, 3rd Edition Publisher : Wiley.
5. "Principles of Modern Communication Systems", by Samuel O. Agbo , Matthew N. O. Sadiku 2017
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL3-07	JAMMING AND ECM/ECCM TECHNOLOGIES						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the concept of jamming, frequency matching, continuous interference, factors affecting ECM, basic principle of noise jamming, different types of jamming systems, ECM techniques, and ECCM.						
Course Outcomes							
CO 1	Students will be able to understand the concept of electronic attacks						
CO 2	Students will be able to understand the principles and the practical applications of current and evolving electronic jamming technology.						
CO 3	Students will be able to understand the concept of determination of the satellite's exact location through the reception, processing, and transmitting of ranging signals.						
CO 4	Students will be able to understand the different types of electronic counter measures and counter – counter measures						

### Unit I

Principals of Electronic Attack (EA), Jamming-to-Signal Ratio, Jamming Types Burn-Through, Cover Jamming, Range Deceptive Jamming, Inverse Gain Jamming

### Unit II

Repeater Jamming Equations, Noise Jamming vs. Deception, Repeater vs. Transponder, Side lobe Jamming vs. Main lobe Jamming

### Unit III

Stand-Off Jamming, Escort Jamming, Self-Protection Jamming, ECM techniques, On-Board ECM Systems, Off-Board ECM Systems

### Unit IV

Infrared Countermeasures (IRCM), Off-Board ECM Systems, Communications Countermeasures (COM-ECM), Electro-Optic Counter Measure (EOCM) Systems

### Unit V

Airborne Tactical Jamming System, Shipboard Self-Defense System, EA/Susceptibility against Weapon Systems. Search Radar Counter-Countermeasures, Tracking Radar

### Unit VI

Counter-Countermeasures, Infrared Counter-Countermeasures, Communications Counter-Countermeasures

### Suggested Books:

1. "Electronic Countermeasure and Electronic Counter-Countermeasure", by Bahman Zohuri.
2. "Fundamentals of Electronic Warfare 2001", by S.A. Vakin, L.N. Shustov, R.H. Dunwell.
3. "Communications, Radar and Electronic Warfare by Adrian Graham 2010
4. "Electronic Warfare & Radar Systems Engineering Handbook" 2013, Naval Air Warfare Center Weapons Division.

5. "EW 101: A First Course in Electronic Warfare (Artech House Radar Library)", 1st Edition
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

### MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL3-08	SOFTWARE DEFINED RADIOS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide understanding of the fundamental of software defined radios, different aspects of SDRs, practical scenarios along with knowledge of different SDR hardware and software.						
Course Outcomes							
CO 1	Students will be able to understand the concept, application of SDRs						
CO 2	Students will be able to understand of analog RF components as front end block in implementation of SDR.						
CO 3	Students will be able to gain knowledge of digital hardware architectures and its development techniques.						
CO 4	Students will be able to gain knowledge of software development for embedded wireless systems						

#### Unit I

SDR introduction, major standards, SDR architecture, SDR enablers, advantage /disadvantages, Applications

#### Unit II

Waveform platform bifurcation, red – black separation, digital modulation- advanced linear and non-linear bandwidth efficient modulations. Bandwidth and power efficiency, peak to average power, error vector magnitude and error probability

#### Unit III

SDR Hardware, super-heterodyne architecture, homodyne architecture, advantages & disadvantages, Software for SDR, Processing architecture for SDR

#### Unit IV

RF channels, receiver channel equalization, multiple access techniques Frequency, time and code division techniques as well as carrier sensing, Wireless sensor networks and beam steering in azimuth and elevation, receiver analogue signal processing, receiver digital signal processing

#### Unit V

Source and channel coding (Source and channel coding, sampling, entropy, data compression, voice coding, block and convolution coding, turbo coding, space-time coding and trellis coding).

#### Unit VI

Case studies in software radio design, Introduction and a Historical perspective

#### Suggested Books:

1. "Software Radio, (A modern approach to radio engineering)", by Jeffery H.Reed  
Publisher : PHI PTR.
2. "RF and Digital Signal Processing for Software Defined Radio", by John J. Roupheal.  
Publisher: Elsevier.

3. "Digital Techniques in Frequency Synthesis", by B.G. Golderg. Publisher: McGraw-Hill.
4. "Multirate Signal Processing", by N.J. Fliege. Publisher: John Wiley and sons.
5. Literature / books suggested by respective course Lecturers Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**



**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-09	ADVANCED LIGHTWEIGHT AND COMPOSITE STRUCTURES						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To impart thorough knowledge of advanced composite materials, their manufacturing techniques and to develop mathematical models & design structures made of composites. Basic understanding of structures used in airborne systems like missiles and aircrafts& their performance under static and dynamic loading, including crash and bird strike will also be covered.						
Course Outcomes							
CO 1	Students will be able to understand the design of advanced structures and lightweight materials for aerospace materials						
CO 2	Students will be able to understand the numerical and analytical skills in structural mechanics for both composite and metallic components.						
CO 3	Students will be able to gain knowledge of digital hardware architectures and its development techniques.						
CO 4	Students will be able to apply knowledge to solve real engineering problems						

**Unit I**

Review of Strength of Materials, Introduction to Aerospace Materials – Metal Alloys and Fiber Reinforced Composite

**Unit II**

Introduction to different types of constructions: Monocoque, Semi-Monocoque, Truss, and Corrugated shell

**Unit III**

Introduction to Aircraft and Missile Structural Components: Spars; Ribs; Stringer; Longerons

**Unit IV**

Analysis of stress; Analysis of strain

**Unit V**

Material Constitutive Relations.

**Unit VI**

Failure Theories; Fatigue theory

**Suggested Books:**

1. "Composite Structures Safety Management", by Dr. Bjorn Backman. Publisher: Elsevier Science.
2. "Composite Structures: Design, Mechanics, Analysis, Manufacturing and Testing", by Manoj Kumar Buragohain. Publisher: CRC Press.
3. "Lightweight Composite Structures in Transport: Design, Manufacturing, Analysis and Performance", by James Njuguna Woodhead Publishing, 2016
4. "Structural and Stress Analysis", by T.H.G. Megson. Publisher: Butterworth-Heinemann.
5. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-10	TEST METHODOLOGIES FOR DEW SYSTEMS (LASERS & MICROWAVE)						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the testing requirements, characterization, system performance testing procedures, test setups, safety standards, safety tools of laser and microwave-based DEW systems.						
Course Outcomes							
CO 1	Students will be able to understand the characterization and testing requirements of DEW systems						
CO 2	Students will be able to carry out the indoors & outdoors system performance testing.						
CO 3	Students will be able to understand the safety issues, safety standards, handling high power sources.						

**Unit I**

Testing requirements of DEW system, types of testing, laser effect testing on target, system output testing

**Unit II**

System performance testing, System outdoor test & measurement instruments

**Unit III**

Laser testing issues, Laser safety, Laser safety standards, laser safety tools

**Unit IV**

Microwave system testing Impedance measurement, S-Parameters and the Smith Chart

**Unit V**

Power Measurement, Noise Figure and Phase Noise measurement, Frequency measurements (Spectrum Analysis), Gain Compression and Intermodulation, Network Analysis

**Unit VI**

Microwave subsystem / system characterization techniques. HPM safety tools, safety standards

**Suggested Books:**

1. "An Introduction to Microwave Measurements", by Ananjan Basu.
2. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-11	ADVANCED ANALYTICAL TECHNIQUES/LAB TESTING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To impart an in-depth knowledge of material characterization by all the conventional well-established techniques used worldwide. The course provides understanding on the material characterization, having main focus on polymeric techniques, chromatography and Spectroscopy.						
Course Outcomes							
CO 1	Students will be able to understand different characterization techniques						
CO 2	Students will be able to apply appropriate analytical technique for a particular material organic/ inorganic/ nanomaterial/polymer etc.						

**Unit I**

Instrumental Analysis: Qualitative analysis

**Unit II**

Genesis of instrumental analysis, hyphenated techniques

**Unit III**

Polymeric Techniques: Rheology Techniques, Molecular weight determination; Thermal Techniques: Thermo Gravimetry (TG), Differential Thermal Analysis (DTA), and Differential Scanning Calorimetry (DSC)

**Unit IV**

Chromatographic Techniques: Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Thin Layer Chromatography (TLC), Ion chromatography

**Unit V**

Spectroscopy: Ultraviolet-Visible Spectroscopy UV-VIS, Infra-Red spectroscopy (IR), Nuclear Magnetic Resonance (NMR), Mass spectroscopy, Atomic Absorption Spectroscopy (AAS)

**Unit VI**

XRD and SEM techniques, Sensitivity studies

**Suggested Books:**

1. "Fundamentals of molecular spectroscopy" by C. N. Banwell. Publisher: McGraw Hills.
2. "Introduction to Spectroscopy" by Donald L. Pavia, Gary M. Lampman, and George S. Kriz. Publisher: Cengage Learning, 2014.
3. "Chromatography: Concepts and Contrasts" by James M. Miller. Publisher: Wiley.
4. "Chromatography: Principles and Instrumentation", by Mark F. Vitha. Publisher: Wiley.
5. "Elements of X-Ray Diffraction" by B.D. Cullity Deceased, S.R. Stock. Publisher: Pearson.
6. "Electron Microscopy: Principles and Fundamentals" by S. Amelinckx, Dirk van Dyck, J. van Landuyt, Gustaaf van Tendeloo. Publisher: Wiley.
7. "Polymer Characterization: Physical Techniques", by Dan Campbell, Richard A. Pethrick, Jim R. White 2nd Edition. Publisher CRC Press.
8. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL3-12	SONAR SYSTEM ENGINEERING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide an in-depth understanding of underwater acoustic principles, sonar technology and applications, hardware and software design engineers new to sonar system design.						
Course Outcomes							
CO 1	Students will be able to know the basic building blocks of a radar system						
CO 2	Students will be able to have an in-depth knowledge on different types of signals that are used.						
CO 3	Students will be able to know about the ambiguity function and its significance in radar signal processing						
CO 4	Students will be able to know the physics behind sound propagation in water and principle of operation of sonar						
CO 5	Students will be able to apply the knowledge acquired in this course in real time applications						

**Unit I**

Mathematical development and discussion of fundamental principles that pertain to the design and operation of passive and active sonar systems critical to naval operation.

**Unit II**

Topics from complex aperture theory, array theory

**Unit III**

Signal processing

**Unit IV**

Introduction to undersea warfare and engineering acoustics

**Unit V**

Principles of optimal signal processing techniques for detecting signals in noise, maximum likelihood, Bayes risk

**Unit VI**

Neyman-Pearson and min-max criteria and calculations of their associated error probabilities (ROC curves)

**Suggested Books:**

1. "Fundamentals of Radar, Sonar and Navigation Engineering", by K. K. Sharma.
2. "Principles of Modern Radar: Advanced techniques", by editor William L. Melvin.
3. "An Introduction to Sonar Systems Engineering", by Lawrence J. Ziomek.
4. "Sonar for practicing engineers", by A. D. Waite.
5. "Underwater Acoustics: Analysis, Design and Performance of Sonar", by Richard P. Hodges.
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

# **Semester 2, Elective-IV Courses (For All Specializations)**



## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL4-01	UNMANNED AERIAL VEHICLE DESIGN						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide the understanding of the initial designing and sizing process for rapidly growing fixed – wing UAV technology, integrated with its performance and stability analysis, air safety issues, airworthiness and prototype testing.						
Course Outcomes							
CO 1	Students will be able to understand the design requirements, design parameters of UAV.						
CO 2	Students will be able to perform the aerodynamic analysis, performance and stability analysis.						
CO 3	Students will be able to understand the performance testing of the UAVs.						
CO 4	Students will be able to understand the airworthiness and safety requirements of UAV.						

### Unit I

UAV design Requirements, design parameters, design algorithms, Certification approaches: aircrafts and UAVs. Airworthiness of aircrafts and UAVs

### Unit II

Air safety issues. Handling qualities. Manoeuvrability requirements. Aircraft design; UAV system design. UAV system identification

### Unit III

UAV aerodynamics, structures and propulsion, performance and stability analysis

### Unit IV

UAV project life cycles. Stages of Aircraft design. Initial sizing: aircrafts and of UAVs

### Unit V

Ground control systems. Ground and flight testing of UAVs. UAV guidance and Navigation. Design for reliability

### Unit VI

Wind Tunnel Testing, Aerodynamic Characterization through Wind Tunnel Testing

### Suggested Books:

1. "Introduction to Flight", by John D. Anderson
2. "Performance, Stability, Dynamics, and Control of Airplanes", by Bandu N. Pamadi.
3. "Aircraft performance and design", by John D. Anderson.
4. "Unmanned Aircraft Design A review of fundamentals", by Mohammad H. Sadraey.
5. "Aircraft Design: A Conceptual Approach", by Daniel P. Raymer.
6. "Unmanned Aircraft Systems: UAVs Design Development and Deployment", by Reg Austin.
7. "Small Unmanned Fixed-wing Aircraft Design: A Practical Approach", by Andrew J. Keane and James P. Scanlan.
8. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL4-02	NAVAL OCEAN ANALYSIS AND PREDICTION						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide understanding of the science and art of Naval Ocean. They will learn methods of analysis of ocean data, to model Naval Ocean, to generate global ocean circulation prediction system, Shallow Water Analysis and Forecast System (SWAFS).						
Course Outcomes							
CO 1	Students will be able to understand and develop the Navy Ocean modeling and prediction program						
CO 2	Students will be able to understand the need to evaluate ocean models and prediction systems for operational and tactical applications						
CO 3	Students will be able to understand and predict environmental conditions in the coastal ocean						

**Unit I**

Advanced knowledge of the Indian Navy Ocean analysis and prediction systems

**Unit II**

Naval Ocean Modeling Program (NOMP), Naval Ocean data systems

**Unit III**

Atmospheric forcing systems, data assimilation systems

**Unit IV**

Optimal Thermal Interpolation System (OTIS), Thermal Ocean Prediction Systems (TOPS)

**Unit V**

Fundamental concepts in turbulence. The atmospheric planetary boundary layer, including surface layer, and bulk formula for estimating air-sea fluxes

**Unit VI**

The global ocean circulation prediction system, Shallow Water Analysis and Forecast System (SWAFS), Knowledge of ocean eddies

**Suggested Books:**

1. Indian Navy: Ocean of opportunities (Defence Series Books) Author: by PRANAV ZOPE
2. Elements of Ocean Engineering. Author Robert E. Randall
3. Ocean Modelling for Beginners - Using Open-Source Software. Author Jochen Kaempf.
4. Literature / books suggested by respective course Lecturers

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL4-03	MODELING & SIMULATION OF LASER MATTER INTERACTION						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide understanding on the high-power laser beam interaction with metals and composite materials, physics-based models for the lethality modeling, damage mechanism & damage threshold measurement techniques and performance evaluation of high-power laser systems.						
Course Outcomes							
CO 1	Students will be able to understand of the laser matter interaction						
CO 2	Students will be able to develop physics-based model for evaluation of effect of laser on metals and composites						
CO 3	Students will be able to understand the laser parameter measurement techniques						
CO 4	Students will be able to analyse the performance of high-power laser systems						

#### Unit I

Laser beam characteristics, Laser lethality modeling & simulation with metal targets & composite materials

#### Unit II

Physics based models for vulnerability assessment, Effect of laser on metals & composite materials.

#### Unit III

Measurement and Characterization of Damage Thresholds, Mechanisms of Damage, Exposure Limits and Their Interpretation

#### Unit IV

Analysis Tools for the Estimation of Hazards, Laser parameters measurement techniques

#### Unit V

Tools to analyze and predict Laser System performance under different conditions like land, sea air, etc.

#### Unit VI

Introduction of full-scale end to end modeling of laser system performance

#### Suggested Books:

1. "High Power Laser-Matter Interaction", by Mulser, Peter, Bauer, Dieter. Publisher : Springer.
2. Literature / books suggested by respective course Lecturers

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.** The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL4-04	COMPUTATIONAL AERODYNAMICS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the computational aerodynamics, numerical methods for solving systems of equations, numerical modelling of fluids, CFD analysis, turbulence modelling.						
Course Outcomes							
CO 1	Students will be able to understand the CFD analysis, fluid mechanics, heat transfer analysis, numerical modelling of fluids						
CO 2	Students will be able to generate numerical model related to fluid dynamics						
CO 3	Students will be able to do the pre and post processing of CFD analysis						

**Unit I**

Introduction to fluid mechanics & heat transfer

**Unit II**

Introduction to numerical analysis, Discretisation approaches: finite difference, finite volume, finite element and spectral methods

**Unit III**

Numerical methods for algebraic equations/systems of equations, Numerical schemes for hyperbolic, parabolic and elliptic systems and for fluid dynamics

**Unit IV**

CFD analysis

**Unit V**

Numerical modeling of compressible & in-compressible flow, turbulence modeling

**Unit VI**

Grid generation/CAD, data analysis and uncertainties

**Suggested Books:**

1. "A Textbook of Heat Transfer Paperback", by S.P. Sukhatme. Publisher: Universities Press.
2. "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", by H. Versteeg. Publisher: Pearson.
3. "Computational Fluid Dynamics the Basics with Applications", by John D. Anderson, Jr. Publisher: McGraw Hill Education.
4. "Fluid Mechanics: Volume 2: Foundations and Applications of Mechanics (Cambridge-iisc)", by C. S. Jog. Publisher : Cambridge University Press; 3rd edition.
5. "Numerical Modeling and Computer Simulation", Edited by DraganCvetković, publisher intechopen.
6. Literature / books suggested by respective course Lecturers

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL4-05	LAUNCH VEHICLE DESIGN & ANALYSIS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the launch vehicle design and analysis, components and subsystems of the launch vehicle, propulsion systems.						
Course Outcomes							
CO 1	Students will be able to understand the launch vehicle requirements, its functioning						
CO 2	Students will be able to design and analysis of launch vehicles						
CO 3	Students will be able to understand the propellant requirement for launch vehicles						

### Unit I

Introduction to propulsion for launch vehicles, beginning with mission energy requirements and an overview of current and proposed launch propulsion devices

### Unit II

Performance analysis, operating characteristics and propellant selection criteria for air breathing and solid

### Unit III

Liquid and nuclear rocket motor propulsion systems

### Unit IV

Advanced cycles and concepts are presented. Design of components and subsystems

### Unit V

FE modelling: Idealization, Discretization, Meshing and Post Processing

### Unit VI

Tracking and controlling errors, Nonlinear analysis in FEM, Launch dynamic analysis

### Suggested Books:

1. "Design of Rockets and Space Launch Vehicles", by Don Edberg, Willie Costa. Publisher : American Institute of Aeronautics & Ast. (August 21, 2020)
2. "Modern Engineering for Design of Liquid Propellant Rocket Engines (Progress in Astronautics and Aeronautics)", by Dieter K Huzel, David H Huang. Publisher : AIAA (American Institute of Aeronautics & Astronautics); Revised, Subsequent edition.
3. "Fundamentals of Astrodynamics 1st Edition", by Roger R. Bate, Donald D. Mueller. Publisher: The American Design Ethic, MIT, USA.
4. "Commercial Launch Vehicle Design", by Nickolay Mykola Zosimovych. Publisher: Lap Lambert Academic Publishing.
5. "Space Vehicle Design, Second Edition", by Michael D. Griffin and James R. French. Publisher The American Institute of Aeronautics and Astronautics, Inc.
6. Literature / books suggested by respective course Lecturers

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***



**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL4-06	ACQUISITION, TRACKING & POINTING TECHNOLOGY						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the acquisition, tracking & pointing technologies, development of tracking algorithms, design and analysis of tracking systems.						
Course Outcomes							
CO 1	Students will be able to understand the concepts and basic systems requirements tracking systems						
CO 2	Students will be able to understand the system configurations and critical component characteristics required in the design of stabilized pointing and tracking systems, along with an introduction to some more advanced concepts						
CO 3	Students will be able to understand the control system and algorithm techniques and practices commonly utilized in the design of tracking systems						

**Unit I**

Acquisition, tracking, and pointing (ATP) design for military systems

**Unit II**

Target tracking and related mathematics, SNR requirement, the Johnson criteria, probability of estimation, detection criteria

**Unit III**

Tracking algorithms, track filters, multi target tracking

**Unit IV**

Electronic countermeasures against modern target tracking radars

**Unit V**

Multiplatform-multi-sensor-multi target tracking

**Unit VI**

Doppler and Electro-Optical methods of tracking

**Suggested Books:**

1. "Acquisition, Tracking, Pointing, and Laser Systems Technologies XXI (Pro-ceedings of SPIE)" 30 October 2007 by Steven L. Chodos (Editor), William E. Thompson (Editor).
2. "Acquisition, Tracking, and Pointing, January 2017 In book: Free Space Optical Communication", by Hemani Kaushal, Vk Jain and SubratKar. Publisher: Springer India.
3. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL4-07	DATA ACQUISITION, TRACKING & POST FLIGHT ANALYSIS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the various aspects of flight trials, measurements & calibration, Generation & analysis of Data.						
Course Outcomes							
CO 1	Students will be able to understand the interfaces used in data acquisition and standalone instruments to real-world signals						
CO 2	Students will be able to understand the Sensors and transducers, Data acquisition hardware and data acquisition software						
CO 3	Students will be able to carry out post flight analysis						

### Unit I

Importance of Flight Trials in Missile Development, Facilities, Safety Requirements

### Unit II

Methods of Measurement, Introduction to Measuring Instruments: Functional elements of an instrument

### Unit III

Static and Dynamic Characteristics, Zero, First and Second order of Instruments and their response

### Unit IV

Calibration of Instruments

### Unit V

Sensors and Transducers: Passive and Active types, their uses in measurement of acceleration, angle, vibration, pressure, flow and temperature, strain etc.

### Unit VI

Methods for post flight data analysis

### Suggested Books:

1. "Advances in Missile Guidance, Control, and Estimation: 47 (Automation and Control Engineering)", by editors S.N. Balakrishnan, A. Tsourdos, B.A. White.
2. "Calibration Handbook of Measuring Instruments 1st Edition", by Alessandro Brunelli. Publisher: International Society of Automation.
3. "Calibration Book", by Janne Kivilaakso, Antero Pitkääkoski Jori Valli, Mike Johnson, Nobuo Inamoto Arja Aukia Masaki Saito. Publisher: VaisalaOyj.
4. "Sensors and Transducers", by Patranabis D. Publisher: Prentice Hall India Learning Private Limited.
5. "Sensors And Transducers Paperback", by Ian Sinclair. Publisher: Elsevier.
6. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of ***THIRTEEN*** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL4-08	AIR INDEPENDENT PROPULSION AND BATTERIES						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the air independent propulsion systems, hybrid electric vehicles, power requirement of the vehicles, energy storage systems						
Course Outcomes							
CO 1	Students will be able to understand the requirements of air independent propulsion systems.						
CO 2	Students will be able to design and analysis of hybrid electric drive trains						
CO 3	Students will be able to design and analysis Energy storage systems for hybrid electric vehicles						

**Unit I**

Introduction to Hybrid Electric Vehicles: Impact of modern drive-trains on energy supplies

**Unit II**

Hybrid Electric Drive-trains: hybrid traction, various hybrid drive-train topologies, power flow control, fuel efficiency analysis

**Unit III**

Electric Drive-trains: electric traction, electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

**Unit IV**

Electric Propulsion unit: electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, Switch Reluctance Motor drives, drive system efficiency

**Unit V**

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles

**Unit VI**

Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices

**Suggested Books:**

1. "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", by Chris Mi, M. Abul Masrur. Publisher: Wiley.
2. "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, Second Edition (Power Electronics and Applications Series)", by Mehrdad Ehsani, Yimin Gao, Ali Emadi, Publisher: Standards media.
3. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

## MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL4-09	ADVANCED DIGITAL MODULATION TECHNOLOGIES & STANDARDS						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide knowledge on the engineering principles, theories and practices of a digital communication system. The course will deal with the design principles of transmitter and receiver so as to establish a reliable communication link						
Course Outcomes							
CO 1	Students will be able to understand the design digital communication systems						
CO 2	Students will be able to understand the transmitter, receiver communications system models, voice source coding– pulse code modulation, delta modulation and vocoders						
CO 3	Students will be able to understand the requirement of cellular communication						

### Unit I

Design of digital communication system, transmitter and receiver communications system model

### Unit II

Voice source coding– pulse code modulation, delta modulation, vocoders

### Unit III

Digital modulation – Amplitude-shift, Frequency-shift, Phase-shift, differential phase shift, Quadrature phase-shift, Quadrature phase-shift, and Minimum-shift keying, Quadrature amplitude modulation

### Unit IV

Communications channel – Multipath effects, fading and diversity, models of Egli and Murphy

### Unit V

Receivers – super heterodyne systems, balanced and unbalanced mixers, frequency synthesizers, Link budget analysis

### Unit VI

Introduction to cellular communication – CDMA, OFDM, MIMO, Introduction to digital modulation standards

### Suggested Books:

1. "Communication Systems", by, Haykin, S. Publisher : John Wiley & Sons.
2. "Modern Digital and Analog Communication Systems", by, Lathi, B.P. and Ding, Z. Publisher: Oxford University Press.
3. Literature / books suggested by respective course Lecturers.
4. "Signal Processing for Wireless Communication Systems", by H. Vincent Poor, Lang Tong, Publisher: Springer.
5. "Digital Communication: Fundamentals and Applications", by Sklar, B., and Ray, P.K. Dorling Kindersley.
6. "Communication Systems: An Introduction to Signals and Noise in Electrical Communication", by Carlson, A.B., Crilly, P.B. and Rutledge, J.C Publisher: McGraw-Hill.

7. "Detection, Estimation and Modulation Theory Part I", by Van Trees, H.L. Pub-lisher : Wiley Inter science.
8. "Information Theory, Coding and Cryptography", by Bose, R. Tata McGraw-Hill.
9. "Digital Communication", by Barry, J.R., Lee, E.A. and Messerschmitt, D.G.Kluwer.
10. "Principles of Digital Transmission: Wireless Applications", by Benedetto, S. and Biglieri, E. Publisher: Springer.
11. Literature / books suggested by respective course Lecturers

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)**

DT-EL4-10	TRAJECTORIES MODELLING & SIMULATION						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide the understanding of flight dynamics, trajectory design analysis, flight performance analysis and practical implications of trajectory planning						
Course Outcomes							
CO 1	Students will be able to understand the flight trajectories design requirements						
CO 2	Students will be able to evaluate and predict the flight performance for different trajectories						
CO 3	Students will be able to understand the practical implications while trajectory design						
CO 4	Students will be able to carry out MATLAB based simulation for trajectory modelling						

**Unit I**

Flight Dynamics, Flight envelope limitations. Aerodynamic sizing-equations of motion. Accuracy of simplified equations of motion, orbital mechanics

**Unit II**

Role of rocket propulsion in orbital trajectories and maneuvers, Maximizing missile flight performance. Benefits of flight trajectory shaping

**Unit III**

Flight performance prediction of boost, climb, cruise, coast, steady descent, ballistic, maneuvering, divert, and homing flight

**Unit IV**

Practical implementation of integrated trajectory planning, Agility in maneuvering trajectories

**Unit V**

Multiplier theory and its use in solving practical problems covered from a real-time computational viewpoint, No-fly zones and engineering requirements, formulation as a mathematical mixture of state and decision-variable constraints

**Unit VI**

Extensive MATLAB-based mini-projects

**Suggested Books:**

1. "Flight Dynamics", by Robert F. Stengel. Publisher: Princeton University Press.
2. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**



The student will attempt a total of **SEVEN** questions, including compulsory Q. No. 1 and **remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.**

#### MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (2<sup>nd</sup> Sem.)

DT-EL4-11	SENSOR TECHNOLOGY						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	60	40	100	3
Objective	To provide learning on the basic physical principles and characteristic features in sensor technology, design, function and applications of different sensors						
Course Outcomes							
CO 1	Students will be able to understand the basic principles of sensor systems required for satellites and tactical aircraft						
CO 2	Students will be able to understand the atmospheric propagation and its impact on the performance of sensors						
CO 3	Students will be able to troubleshoot, repair/replace a faulty sensor in optimize process efficiency						

#### Unit I

Physical principles underlying the sensor systems needed for satellites and tactical aircraft, as well as limitations imposed by the atmosphere and operating environment on these systems and their communication links

#### Unit II

Phased array and pulsed compressed radars, imaging synthetic aperture and inverse synthetic aperture radars

#### Unit III

Atmospheric propagation of signal. Noise resources and thermal radiation

#### Unit IV

Principles of semiconductor devices. Optical and infrared imaging detector systems

#### Unit V

Detector resolution limitations and bandwidth requirements, Relationship between signals and noise

#### Unit VI

The characteristics of critical sensor functions (including detection, estimation, imaging, and tracking).

#### Suggested Books:

1. "Handbook of Modern Sensors", by Jacob Fraden. Publisher: Springer.
2. "Micro sensors, Principles and Applications", by J. W. Gardner. Publisher: Wiley.
3. "Semiconductor Sensors", by S. M. Sze. Publisher: Wiley.
4. Literature / books suggested by respective course Lecturers.

**Note:** The paper will have a total of **THIRTEEN** questions. Question No. 1, which is compulsory, shall be OBJECTIVE Type and have contents from the entire syllabus (all SIX Units). **Q. No. 1 carries 12 Marks.**

The student will attempt a total of ***SEVEN*** questions, including compulsory Q. No. 1 and ***remaining SIX questions by selecting only one question from each unit and each question carries 8 Marks.***

# Semester III

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (3<sup>rd</sup> Sem.)**

DT-PDP-01	PROJECT DISSERTATION- PHASE 1						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
0	0	20	10	00	100	100	
Objective	To identify the potential topics of research for dissertation phase II						
Course Outcomes							
CO 1	Students will be able to perform literature survey to identify the problem						
CO 2	Students will be able to identify the research gaps assisting them in problem formulation						
CO 3	Students will be able to formulate objectives, tools and methodology to pursue dissertation-II project						

The objective of First stage dissertation is to identify the topic and problem for the dissertation. An exhaustive review of literature is to be done and place the problem suitably in overall realm of research arena so that exact gap is identified. The student should have clear idea of objectives, tools, and methodology for the problem in hand. The student will present at least two seminars regarding the project.

M. Tech. Project phase-I may be done in respective DRDO labs, DRDO established Centre of Excellence, DIAT Pune, PSUs and private defence industries. As regard M.Tech dissertation based upon the topic of dissertation, the respective students will be placed appropriately to the various respective labs located all over countries.

**MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (3<sup>rd</sup> Sem.)**

DT-PDP-01	SEMINAR/INDUSTRIAL TRAINING						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
0	0	8	4	00	100	100	
Objective	To expose students to the 'real' working environment of defence sector and get them acquainted with the organization structure, industrial operations and administrative functions						
Course Outcomes							
CO 1	Students will be able to demonstrate the knowledge gain through cutting-edge technology related with defence sector						
CO 2	Students will be able to have hands-on-experience in defence industries and able to reinforce what has been taught at the university						

Industrial Training may be done in respective DRDO labs, DRDO established Centre of Excellence, DIAT Pune, PSUs and private defence industries.

The candidate has to submit a training report of his/her work/project/assignment completed in the industry during the training period. The evaluation will be made on the basis of submitted training report and viva-voce/presentation.

# Semester IV

### MASTER OF TECHNOLOGY IN DEFENCE TECHNOLOGY (3<sup>rd</sup> Sem.)

DT-PDP-02	PROJECT DISSERTATION- PHASE 2						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
0	0	40	20	200	100	300	
Objective	The main objective of the course is to make the students able to do some good research in the field of their interests related to defence sector or interrelated fields of applications						
Course Outcomes							
CO 1	Students will be able to conduct investigations of engineering problems using research-based knowledge and experimental/research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.						
CO 2	Students will be able to apply resources and modern engineering tools and techniques with an understanding of the limitations.						
CO 3	Students will be able to either work in a research environment or in an industrial environment.						
CO 4	Students will be conversant with technical report writing, professional ethics, responsibilities and norms of the engineering practice						
CO 5	Students will be able to present and convince their topic of study to the engineering community						

M. Tech. Project phase-II may be done in respective DRDO labs, DRDO established Centre of Excellence, DIAT Pune, PSUs and private defence industries. As regard M.Tech dissertation based upon the topic of dissertation, the respective students will be placed appropriately to the various respective labs located all over countries.

The students are required to continue Analytical/Experimental/Computational/Industrial Problems or Case studies investigations in the field of defence sector or other related fields which have been finalized in the third semester. They would be working under the supervision of a DRDO Scientist/faculty member. The students will be required to submit a progress report duly signed by their respective supervisors to the department, related to their dissertation work as per academic calendar. The progress report will cover the following:

- ❖ The goal set for the period.
- ❖ Research papers studied.
- ❖ Methodology used in achieving the goal.
- ❖ The extent of fulfillment of the goal.
- ❖ References

The progress report must be of at least of 3-4 pages and the cover page should include the tentative topic, name of the candidate, name of the supervisor, period of progress report, signature of candidate and supervisor. The candidate has to prepare a detailed dissertation report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up/numerical details/industrial case study etc. as the case may be) of solution and results and discussion. The report must bring out the conclusions of the work and future scope for the study. The final dissertation will be submitted in the end of semester as per academic calendar for the session, which will be evaluated by internal as well as external examiners based upon his/her research work. The

dissertation should be presented in standard format as provided by the department. The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a supervisor, co- supervisor etc. as decided by the Head and PG coordinator. The candidate has to be in regular contact with his supervisor