Kavyitri Bahinabai Chaudhari North Maharashtra University,

Dist. Jalgaon, 425 001 (M.S.)

Bachelor of Vocation (B.Voc.)

This Syllabus design and developed as per
The QPs (Qualification Packs) and NOS (National Occupation Standard)

Provided by
NSDC and Agriculture Skill Council of India: ASCI

Syllabus for

S. Y. B. Voc.

Soil and Water Conservation

(To be implemented from academic year 2019-20)

S. Y. B. Voc. Soil and Water Conservation Syllabus

Course Level	:	NSQF LEVEL 6
Job Role	:	1. Soil & Water Testing Lab Analyst 2. Soil & Water Testing Lab Assistant 3. Soil Sampler/Collector 4. Micro Irrigation Technician
Course Name	:	Soil and Water Conservation
Course Pattern	:	CGPA [60+40] pattern Semester (I and II)
Eligibility	:	NSQF LEVEL 5
Medium of Instruction	:	English

❖ **Micro Irrigation Technician**:

The individual holds a very critical role in the installation and function of micro irrigation system that not only uses the existing natural resources efficiently but also benefits the farmers in terms of decreased cost of cultivation in the long run.

Brief Job Description: The individual is responsible for Installation, Testing, and Commissioning of Micro Irrigation System at field level and thus ensure uninterrupted supply of water to the plant stand on the farm.

❖ **Soil & Water Testing Lab Analyst:**

The individual plays a critical role in soil & water testing & analysis and recommending fertilizer & nutrient doses accordingly.

Brief Job Description: The individual is responsible for conducting soil & water test and interpreting the soil analysis results in relation to the soil fertility management. S/he prepares the Soil & Water Health card illustrating the desired cropping pattern, soil amendments & integrated nutrient management, irrigation & water management to be undertaken.

❖ **Soil & Water Testing Lab Assistant:**

The individual plays a critical role in executing various operations involved in soil & water testing.

Brief Job Description: Under minimum supervision, the individual is responsible for cleaning of laboratory equipment utilizing proper cleaning protocols and procedures, processing soil & water samples for testing and maintaining records, preparation of chemical solutions used in the laboratory, data entry and dissemination of soil & water health cards.

Applicable National Occupational Standards (NOS):

1. AGR/N1004Designing and Layout of Micro Irrigation System
2. AGR/N1005Installation of Micro Irrigation System
3. AGR/N1006Maintenance of Micro Irrigation System
4. AGR/N9903Maintain Health & Safety at the workplace
5. AGR/N8101 Adhere to Sanitation & Safety guidelines of the Lab
6. AGR/N8108 Conduct Soil Physical & Chemical Analysis
7. AGR/N8109 Conduct Water Sample Analysis
8. AGR/N8110 Prepare Soil & Water Health Card
9. AGR/N8111 Supervise & Train Lab Assistant in Good Lab Practices
10. AGR/N8101 Adhere to Sanitation & Safety guidelines of the Lab
11. AGR/N8105 Register and Prepare Soil & Water samples for analysis in the Lab
12. AGR/N8106 Calibrate equipment's & Prepare Solutions for analysis in the Lab
13. AGR/N8107 Assist Lab Analyst in upload & distribution of Soil & Water Health Card.

Objectives:

- To enable students for pursuing respectable career through Self-Employment,
- Executive Employment, Entrepreneurship, Professional Career in the field of service sectors such as High –Tech Farming, Marketing. To develop abilities in farming business.
- To develop the foundation for higher studies in the field of Agriculture.
- To trained future industry professionals.
- To impart comprehensive knowledge with extra emphasis on practice.
- To keep the students up-to-speed on all the latest and cutting edge technologies.

Note:-

1. Each period is considering 1 clock hour.
2. Each course is of two periods per week
3. Each practical needs 02 Practical Sessions of three hours each (02*03=06periods)
4. For each paper 40 marks are for internal assessment and 60 marks are for external.
5. For each practical40 marks are for internal assessment and 60 marks are for external.

Second Year B. Voc. (Soil and Water Conservation)

Semester III

General Component Papers

Sr. No	Paper Code	Paper Name	Modes	Credits	Hours
1	SWC 231	Communication skill	Theory	4	60
2	SWC 232	Agricultural Ecology I	Theory	4	60
3	SWC 233	Watershed Hydrology	Theory	4	60

Skill Component

Sr. No	Paper Code	Paper Name	Modes	Credits	Hours
4	SWC 234	Soil and water conservation	Theory	3	45
5	SWC 235	Agricultural meteorology I	Theory	3	45
6	SWC 236	Agricultural meteorology II	Theory	3	45
7	SWC 237	Practical on agricultural meteorology I	Practical	3	45
8	SWC 238	Practical on agricultural meteorology II	Practical	3	45
9	SWC 239	Soil and water conservation techniques	Practical	3	45

Second Year B. Voc. (Soil and Water Conservation)

Semester IV

General Component Papers

Sr. No	Paper Code	Paper Name	Modes	Credits	Hours
1	SWC 241	Remote sensing, GIS &GPS	Theory	4	60
2	SWC 242	Agricultural Ecology II	Theory	4	60
3	SWC 243	Sprinkler irrigation	Theory	4	60

Skill Component

Sr. No	Paper Code	Paper Name	Modes	Credits	Hours
4	SWC 244	Irrigation wells	Theory	3	45
5	SWC 245	Water lifts for irrigation	Theory	3	45
6	SWC 246	Pump and pumping system	Theory	3	45
7	SWC 247	Practical on irrigation wells	Practical	3	45
8	SWC 248	Irrigation pumps	Practical	3	45
9	SWC 249	Pump and pumping system	Practical	3	45

Examination pattern (60+40 Pattern)

Paper Code	Paper Name	Paper Mode	Total Marks		External (UA)		Internal (CA)	
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
Semester III								
SWC 231	Communication skill	Theory	100	40	60	24	40	16
SWC 232	Agricultural Ecology I	Theory	100	40	60	24	40	16
SWC 233	Watershed Hydrology	Theory	100	40	60	24	40	16
SWC 234	Soil and water conservation	Theory	100	40	60	24	40	16
SWC 235	Agricultural meteorology I	Theory	100	40	60	24	40	16
SWC 236	Agricultural meteorology II	Theory	100	40	60	24	40	16
SWC 237	Practical on agricultural meteorology I	Practical	100	40	60	24	40	16
SWC 238	Practical on agricultural meteorology II	Practical	100	40	60	24	40	16
SWC 239	Soil and water conservation techniques	Practical	100	40	60	24	40	16
Semester IV								
SWC 241	Remote sensing, GIS &GPS	Theory	100	40	60	24	40	16
SWC 242	Agricultural Ecology II	Theory	100	40	60	24	40	16
SWC 243	Sprinkler irrigation	Theory	100	40	60	24	40	16
SWC 244	Principles of drip irrigation	Theory	100	40	60	24	40	16
SWC 245	Irrigation wells	Theory	100	40	60	24	40	16
SWC 246	Pump and pumping system	Theory	100	40	60	24	40	16
SWC 247	Practical on irrigation wells	Practical	100	40	60	24	40	16
SWC 248	Irrigation pumps	Practical	100	40	60	24	40	16
SWC 249	Pump and pumping system	Practical	100	40	60	24	40	16

SWC 231 Communication skill

No. of Credit: 04 **No. of Lecture: 60**

भाषिक कौशल्याचा अभ्यास

१. भाषा आणि संवाद कौशल्य

अ.भाषा म्हणजे काय? मानवी जीवनातील भाषेचे महत्त्व
ब. भाषा आणि भाषा व्यवहार

क. बोलीभाषा आणि प्रमाणभाषा

ड. भाषेचे प्रकार : मौखिक आणि लिखीत

इ. प्रभावी संभाषण : निवेदन, सूत्रसंचालन, अभिवाचन आणि संभाषण कौशल्य

ई. प्रभावी संभाषणासाठी आवश्यक घटक

२. कार्यालयीन पत्रव्यवहार

अ. पत्रलेखन म्हणजे काय? पत्रलेखनाचा उद्देश काय?
ब. कौटुंबिक पत्रलेखन आणि व्यावहारिक पत्रलेखन

क. पत्रलेखन : भाषा, घटक आणि संचरना

ड. व्यावहारिक पत्रलेखनातील भाषिक कौशल्य

इ. व्यावहारिक पत्रलेखनाचे प्रकार : नोकरीसाठी अर्ज,कार्यालयीन कामकाजासाठी अर्जलेखन, कार्यालयाकडून पाठविले जाणारे पत्राचे स्वरुप, कार्यालयाकडून पाठविल्या गेलेल्या पत्राला उत्तराचे स्वरुप

३. कार्यालयीन टीप्पणी लेखन:

अ. टिप्पणी लेखन म्हणजे काय?
ब. टिप्पणी लेखणाचे हेतू व स्वरुप

क. टिप्पणी लेखणाचे प्रकार

ड. टिप्पणी लेखनाची पद्धत

४. अहवाल लेखन

अ. अहवाल म्हणजे काय?
ब. अहवाल लेखनाचा उद्देश

क. अहवाल लेखनाचे स्वरुप

ड. अहवाल लेखनाची पद्धती

५. मराठी लेखनविषयक नियम व मुद्रणशोधण

अ.मराठीची वर्णमाला
ब. मराठी शुद्धलेखन काही महत्त्वाच्या बाबी

क. मुद्रितशोधन : महत्त्व व कार्य

ड. काही महत्त्वाच्या कार्यालयीन शब्दाची सूची

संदर्भसाहित्य –

1. भाषा : स्वरूप आणि कार्य – सुमन बेलवलकर, यशवंतराव चव्हाण महाराष्ट्र मुक्तविद्यापीठ, नाशिक.
2. भाषासंवाद – अनिल गवळी, नंदकुमार मोरे, सायन, पुणे.
3. संवादशास्त्र – श्रीपाद जोशी, विजय, नागपूर.
4. देहबोली – अंजली पेंडसे, नीलकंठ, पुणे.
5. भाषाविवेक – मं. वि. राजाध्यक्ष, श्रीविद्या, पुणे.
6. व्यावहारिकमराठी – ल. रा. नसिराबादकर, फडके, कोल्हापूर.
7. सुगममराठीव्याकरणवलेखन – मो. रा. वाळंबे, नितीन, पुणे.
8. व्यासपीठ – महादेववाळुंज, अक्षरमानव, पुणे.
9. प्रभावी भाषण कला – रवींद्र देसाई, प्रफुल्लता, पुणे.
10. व्यावहारिक मराठी – संपा. सयाजीराव मोकाशी, रंजना नेमाडे, शेतकरी साहित्य इर्जिक (परिषद), बारामती.
11. व्यावहारिक मराठी – स्नेहल तावरे, स्नेहवर्धन, पुणे.
12. व्यावहारिक मराठी – संपा. द. दि. पुंडे, कल्याण काळे, निराली, पुणे.
13. उपयोजित मराठी – संपा. र. ना. वरखेडे, महाराष्ट्र विद्यापीठ ग्रंथनिर्मिती मंडळ, नागपूर.
14. माध्यमांची भाषा आणि लेखनकौशल्य – केशव तुपे, चिन्मय, औरंगाबाद.
15. कार्यालयीन कौशल्ये – अक्षय घोरपडे, अथर्व, जळगाव.
16. उपयोजित मराठी – प्रभाकर जोशी, किशोर पाटील, प्रशांत, जळगाव.
17. उपयोजित मराठी भाग एक – प्रभाकर जोशी, वासुदेव वले, प्रशांत, जळगाव.
18. उपयोजित मराठी : लेखन व संवाद कौशल्यांचा परिचय – सत्यजित साळवे, दीपक पवार, अथर्व, जळगाव.
19. अनिवार्य मराठी – संपा. जॉन्सन बोजर्स, डायमंड, पुणे.
20. उपयोजित मराठी – संपा. केतकी मोडक व अन्य, पद्मगंधा, पुणे.
21. वाङ्मयीन निबंधलेखन स्वरूप आणि साधने – रा. ग. जाधव, कॉन्टिनेन्टल, पुणे.
22. मराठी व्याकरण, निबंध आणि पत्रलेखन – निर्मला रोकडे, शैलजा देवगावकर, श्री साईनाथ, नागपूर.
23. मराठी निबंध पुष्पांजली – शोभना अळवणी, स्टडी सर्कल, मुंबई.
24. निबंध शास्त्र व कला – प्र. न. जोशी, विदर्भ मराठवाडा बुक कंपनी, नागपूर.
25. सुलभ मराठी व्याकरण व लेखन – पद्मिनी बिनीवाले, नवनीत, मुंबई.
26. संवादाची मूलतत्त्वे – श्रीपाद भालचंद्र जोशी, यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक.

SWC 232 Agricultural Ecology I

No. of Credit: 04 **No. of Lecture: 60**

Unit-1 Introduction to agricultural ecology- Introduction, nature, scope and significance, approaches, important of agriculture in Indian economy.

Unit-2 Natural factors influencing agricultural pattern- The terrain , altitude, slope, drainage texture and soil erosion , the climate , temperature, pressure system, air masses and winds, snow, humidity, dew and hoar frost, sunlight and sunshine, rainfall, the soils, the water resources, ground water, surface water, other sources

Unit-3 Non-physical determinants of agricultural pattern- Technological factors, population characteristics, cultural factors, infrastructural services of relevance to agriculture.

Unit- 4 Soil- Soil classification with reference to agricultural pattern, problems of soils affecting agriculture, soil conservation plan.

Reference Books;

1. Symons, leslie(1970) Agricultural geography G.belt and sons ltd,London
2. Morgon W.B. and S.C. Monton (1971) Agricultural geography Methuen, London
3. Singh J. and Dhillon S.S (1994) Agricultural geography, Tata McGraw Hill publication co ltd.
4. Majid Husain (2010) Systematic Agricultural geography, Rawat Publication Jaipur

SWC 233 Watershed Hydrology

Credit Point: 04 **Total Lecture: 60**

Unit-1. Introduction –Importance, Scope and application, division of hydrology, distribution of water on earth, hydrologic data, hydrologic cycle

Unit -2. Precipitation and its occurrence – Forms of precipitation, Types of precipitation, Occurrence of precipitation**,** condensation, cooling process for condensation

Unit -3. Precipitation: measurement and analysis – Rain gauge, rainfall measurement by weather radar, automatic radio-reporting rain gauge, rainfall measurement by satellite, installation of rain gauge, errors in rainfall measurement

Unit -4. Loss of precipitation - Water loss, factor affecting interception, total interception, measurement of interception, evaporation, evaporation from water surface , factors affecting evaporation rate, soil evaporation , factors affecting soil evaporation

Unit -5. Runoff and its computation – Types of runoff, factors affection runoff, runoff computation, rational method

References:

1 Watershed hydrology by R suresh

2 Practical Agricultural Engineering by Ghosh R. K. and Swain S. Vol. I & II., Naya Prakash, Calcutta (1993)

3 'Soil & Water Conservation Engineering' by Suresh R. Standard Publishers & Distributors, (1997)

4 'Principals of Agricultural Engineering' by A. M. Michael & T. P. Ozha by Jain Publishers Vol. I & II.

5 Irrigation - Theory & Practice by Michael A. M. (1998) - Vikas Publishing House, New Delhi.

6 Principles of agricultural engineering vol. I & II by A. M. Michel, T.P.Ojha

SWC 234 Soil and water conservation

Credit Point: 03 **Total Lecture: 45**

Unit -1. Soil Erosion: Effects of soil erosion, factors affecting soil erosion, erosivity And erodibility, causes of soil erosion, types of soil erosion and agency responsible for soil erosion, problems caused by soil erosion.

Unit -2. Measures to control erosion- Agronomical (Contour strip cropping, Vegetation, etc.)Mechanical or engineering (Contour bunding, terracing, their types, etc.).

Unit -3. Soil and water conservation techniques: -Temporary – single row post wood dam, double row post wood dam. Semi-permanent- netting dam, loose boulder structure, Gabion structure, and Permanent structure- check dam.

Unit -4.Water harvesting techniques –grassed waterways, its design. Soil movement method- saltation, surface creep.

Unit -5. Land capability classification: land capability, its meaning, land capability unit, classification, sub classes.

Reference books:-

1. Watershed hydrology, by R Suresh
2. Soil and water conservation by R Suresh
3. Manual of soil and water conservation engineering by Gurmel Singh
4. Ground water hydrology by H.M Raghunath
5. Irrigation Engineering Theory and practice by A. M. Michel
6. Land and water management engineering by V.V.N. Murthy and Madan K. Jha.

SWC 235 Agricultural meteorology I

Credit Point: 03 **Total Lecture: 45**

Unit- 1 Introduction –Composition of atmosphere, weather and climate, scales of climate, branches of meteorology, agricultural meteorology

Unit -2 Radiation – Transfer of heat, Season, aphelion and perihelion, equinox, solstice, isolation , instruments, sunshine recorder, lux meter, quantum sensor, tube solarimeter, angstrom phyrheliometer.

Unit-3 Temperature –Stratification of atmosphere, troposphere, stratosphere, mesosphere, thermosphere, ionosphere

Unit- 4 General circulation – Wind distribution , air masses and fronts, wind rose, cyclones and anticyclones, instruments, aneroid barometer, kew barometer, barograph, wind vane, anemometer.

Reference Books:

1. Agricultural meteorology by G S L H V Rao. PHI learning private limited
2. Agricultural meteorology by R.P. Yadav Rajat publication.
3. Atmosphere, weather and climate Berry R.G and charley R J.
4. Introduction to agro meteorology H.S.Mavi Oxford and IIB Publishing Co new Delhi

SWC 236 Agricultural meteorology II

Credit Point: 03 **Total Lecture: 45**

Unit-1. Atmospheric moisture- Evaporation , evaporation rate across India , daily pan evaporation in humid tropics, measurement of humidity, absolute humidity, specific humidity , mixing ratio, vapour pressure, vapour pressure deficit.

Unit-2. Clouds- Clouds and radiation balance, stability and instability, Condensation, atmospheric nuclei, different forms of condensation, clouds, cloud genera, name of the clouds, description of clouds, and measurement of cloudiness.

Unit-3. Precipitation – Precipitation process, precipitable water, rainfall mechanisms, types of precipitation, convectional precipitation, orographic precipitation, cyclonic precipitation, forms of precipitation , rain , drizzle, snow, sleet, hail.

Unit- 4. Monsoon – Monsoon countries, summer or southwest monsoon, onset and withdrawal of southwest monsoon, onset of monsoon over Kerala, onset of southwest monsoon versus monsoon rainfall over Kerala, winter northeast monsoon.

Unit-5 Drought- Types of drought, all India drought and food grains production, water balance and aridity, aridity and drought.

Reference Books:

1. Agricultural meteorology by G S L H V Rao. PHI learning private limited
2. Agricultural meteorology by R.P. Yadav Rajat publication.
3. Atmosphere, weather and climate Berry R.G and charley R J.
4. Introduction to agro meteorology H.S.Mavi Oxford and IIB Publishing Co new Delhi

SWC 237 Practical on agricultural meteorology I

Credit Point: 03 **Total Lecture: 45**

1. Scope and importance of Agriculture meteorology.
2. Study of various meteorological observatories.
3. Study of various factors affecting soil erosion.
4. Study of instruments used in computation of environmental factors.
5. Study of components of the hydrologic cycle.
6. Study of Measurement of wind.
7. Field visit – I
8. Field visit- II
9. Report writing on field visit

SWC 238 Practical on agricultural meteorology II

Credit Point: 03 **Total Lecture: 45**

1. Study of measurement of evaporation.

2. Study of Measurement of Rainfall

3. Study of analysis of rainfall data.

4. Study of Measurement of soil losses.

5. Application of remote sensing in soil and water conservation

6. Field visit – I

7. Field visit- II

8. Report writing on field visit

SWC 239 Soil and water conservation techniques

Credit Point: 03 **Total Lecture: 45**

1. Study of land capability classification.
2. Study of various soil conservation structures.
3. Study of factors influencing wind erosion.
4. Study of wind erosion control measures.
5. Study of methods of estimating runoff.
6. Study of water harvesting techniques.
7. Study of Soil conservation measures for agricultural land.
8. Study of methods of gully control.
9. Field visit – I
10. Field visit- II

Semester IV

SWC 241 Remote sensing, GIS & GPS

Credit Point: 04 **Total Lecture: 60**

Unit I: Introduction to Remote Sensing

A) Definition, nature and scope of Remote sensing
B) History of Photogrammetry
C) Types of Remote Sensing
D) Basic concept of EMR

Unit II: Aerial Photography, Land Sat-imageries

A) Introduction to Aerial Photography
    i) Type of Aerial Photography
    ii) Type of Cameras
    iii) Type of Films
B) Satellite Imageries
    i)) Type of Satellite & data product
    ii) Use of Remote Sensing techniques in different branches of geography
    iii) Recent development of Indian Remote Sensing

Unit III: Introduction to GIS

A) Definition and History of GIS
B) Component of G.I.S.
D) Geospatial data
    i) Spatial data
    ii) Attribute data
    iii) Joining spatial & Attribute data
E) G.I.S. Function
    i) Spatial data input
    ii) Attribute data management
    iii) Data Output
    iv) Data Exploration

Unit IV: G.I.S. Data Models

A) Spatial data model
    i) Raster data model
    ii) Vector data Model
B) Non- Spatial data model
    i) Hierarchical

ii) Net work
iii) Relational

Unit V: Co-ordinate System

A) Geographic Co-ordinate System
B) Projected Co-ordinate System
i) U.T.M.
ii) U.P.S.
iii) S.P.C.
iv) P.L.S.S.
C) Introduction to GPS
i) Function of GPS
ii) Application of GPS

Reference Books

1. Remote Sensing & Photogrammetry: M.L.Jhanwar, T.S.Chouhan; Vigyan Prakashan, Jodhpur

2. Applied Remote Sensing & Photo-Interpretation: T.S.Chouhan, K.N.Joshi Vigyan Prakashan, Jodhpur

3. Space Today: Mohan Sundara Rajan, National Book Turst, India 4. Remote Sensing in Geography,

4. Rashid S.M.; Manak Publication Pvt. Ltd. (1995)

5. Themotic Cartography and Remote Sensing: Prithvish Nag; Concept Publication Com. New Delhi (1992)

6. Maps & Air Photographs: Dickinson G.C. , Edward Arnold; London (1969)

7. Principles of Remote Sensing: Curran P. Longman; Londan(1989)

8. Fundamentals of Remote Sensing: University Press Pvt.Ltd. Hyderabad (2004)

9. Remote Sensing: Dr. S.N.Karlekar, Diamond Publication Pune (2007)

10. Geographical Information Systems: Dr. S.N.Karlekar, Diamond Publication Pune (2007)

SWC 242 Agricultural Ecology II

Credit Point: 04 **Total Lecture: 60**

Unit-1 Impact of geographical factors on agriculture- Physical factors, physiography, slope, altitude, climate, temperature, sunshine, frost, wind, socio- economic factors, size of holding and fragmentation of fields, labour, capital, mechanization, transport

Unit-2 Types of agriculture- Subsistence and commercial agriculture, types of agriculture, shifting cultivation, intensive subsistence farming, organic farming, plantation agriculture

Unit-3 Agriculture regionalization- Agricultural region, meaning and concept, techniques for the delimitation of agricultural regions, empirical techniques, single elements techniques, multi elements techniques

Unit-4 Agricultural development- Agricultural development, meaning and definition, contribution to Indian agricultural development of the following aspects, green revolution, meaning and its impact on Indian agriculture, white revolution, yellow revolution.

Unit-5 Role of Irrigation in agriculture- Need and importance of irrigation, types of irrigation, methods of irrigation.

Reference Books;

1. Symons, leslie(1970) Agricultural geography G.belt and sons ltd,London
2. Morgon W.B. and S.C. Monton (1971) Agricultural geography Methuen, London
3. Singh J. and Dhillon S.S (1994) Agricultural geography, Tata McGraw Hill publication co ltd.
4. Majid Husain (2010) Systematic Agricultural geography, Rawat Publication Jaipur

SWC 243 Sprinkler irrigation

Credit Point: 04 **Total Lecture: 60**

Unit- 1. Introduction- Objectives, adaptability of sprinkler irrigation, development of sprinkler irrigation, use of sprinkler irrigation

Unit-2 Sprinkler irrigation – Types of sprinkler irrigation system, rotating head, portable system, semi portable system, components of sprinkler irrigation system.

Unit-3 Moisture distribution system- Moisture distribution pattern and uniformity of coverage

Unit-4 Design of sprinkler irrigation system- Inventory of resources and condition, types of system and layout, sprinkler selection and spacing

Unit-5 Operation and maintenance of sprinkler irrigation system – Maintenance, storage, troubleshooting.

References:

1. Practical Agricultural Engineering by Ghosh R. K. and Swain S. Vol. I & II., Naya Prakash, Calcutta (1993)
2. 'Soil & Water Conservation Engineering' by Suresh R. Standard Publishers & Distributors, (1997)
3. 'Principals of Agricultural Engineering' by A. M. Michael & T. P. Ozha by Jain Publishers Vol. I & II.
4. Irrigation - Theory & Practice by Michael A. M. (1998) - Vikas Publishing House, New Delhi.
5. 'Watershed Management' by Dhruvanarayan V. V. &Shastri G. &Patnaik U. S. ICAR Publication 1989.
6. Principles of agricultural engineering vol. I & II by A. M. Michel, T.P.Ojha
7. Principles of drip irrigation system, Dr. M.S. Mane, B.L.Ayare,Dr. S.S.Magar., New Delhi
8. Principles of sprinkler irrigation, Dr. M.S. Mane, Dr.B.L.Ayare. Jain Bros., New Delhi

SWC 244 Principles of drip irrigation system

Credit Point: 03 **Total Lecture: 45**

Unit- 1. Introduction- History of drip irrigation system, development of plastics, process of India regarding micro irrigation, advances in micro irrigation, fertigation system, micro irrigation system, and types of micro irrigation system, crop grown under drip irrigation system, comparison of drip, sprinkler and flood irrigation system, and need of drip irrigation system.

Unit-2 Drip irrigation system – Drip irrigation system, benefits of system, limitation of system, components of drip irrigation system, types of drip irrigation system, operational requirement.

Unit-3 Drippers- Construction and characteristics, Basic requirements of drippers, types of drippers, theory of flow regimes, temperature sensitivity, selection of emitters.

Unit-4 Design of drip irrigation system- Basic information required, design of water requirement, steps in design of drip irrigation system.

Unit- 5 Installation of drip irrigation system- Installation of filter, connecting main and sub main, laying of laterals, punching of lateral and fixing of drippers, installation of pump, testing of the system, instruction given to the operator.

References:

1. Principles of drip irrigation system by M.S.Mane, B.L.Ayare published by Jain brothers
2. Practical Agricultural Engineering by Ghosh R. K. and Swain S. Vol. I & II., Naya Prakash, Calcutta (1993)
3. 'Soil & Water Conservation Engineering' by Suresh R. Standard Publishers & Distributors, (1997)
4. 'Principals of Agricultural Engineering' by A. M. Michael & T. P. Ozha by Jain Publishers Vol. I & II.
5. Irrigation - Theory & Practice by Michael A. M. (1998) - Vikas Publishing House, New Delhi.
6. 'Watershed Management' by Dhruvanarayan V. V. &Shastri G. &Patnaik U. S. ICAR Publication 1989.
7. Principles of agricultural engineering vol. I & II by A. M. Michel, T.P.Ojha

SWC 245 Irrigation wells

Credit Point: 03 **Total Lecture: 45**

Unit -1 Introduction- Learning Objectives, definition of well, aquifers

Unit-2 Groundwater and aquifers – Types of water bearing formations, unconfined aquifers, semi confined aquifers, perched water table.

Unit-3 Wells- Types of aquifers, types of wells, gravity well, artesian well, shallow wells and deep wells, well classification according method of construction.

Unit-4 Hydraulics of wells- Water yield of wells, well characteristics, elements of well design, tube well drilling methods, well construction procedures, location and sanitary protection of wells, tank and ponds, selection of site

References:

1. Principles of drip irrigation system by M.S.Mane, B.L.Ayare published by Jain brothers
2. Practical Agricultural Engineering by Ghosh R. K. and Swain S. Vol. I & II., Naya Prakash, Calcutta (1993)
3. 'Soil & Water Conservation Engineering' by Suresh R. Standard Publishers & Distributors, (1997)
4. 'Principals of Agricultural Engineering' by A. M. Michael & T. P. Ozha by Jain Publishers Vol. I & II.
5. Irrigation - Theory & Practice by Michael A. M. (1998) - Vikas Publishing House, New Delhi.
6. 'Watershed Management' by Dhruvanarayan V. V. &Shastri G. &Patnaik U. S. ICAR Publication 1989.
7. Principles of agricultural engineering vol. I & II by A. M. Michel, T.P.Ojha

SWC 246 Pump and pumping system

Credit Point: 03 **Total Lecture: 45**

Unit-1 Water lifts for irrigation- Introduction- Objectives, indigenous water lift, manually operated device, swing basket, counterpoise lift, Archimedean screw, paddle wheel, Animal power device- Rope and bucket lift, two bucket lift, Persian wheel, chain pump. Wind power water lift- Windmill.

Unit-2 Irrigation pumps- Displacement pumps, reciprocating pump, manually operated twin treadle pump, single acting and double acting type pump, deep well plunger pump, deep well hand pump, pump troubles and their remedies

Unit-3 Centrifugal pumps- Principles of operation of centrifugal pump, pump classification, installation of pump, pump troubles, jet pumps

Unit-4 Vertical turbine pump- Pump construction and operation, selection and installation of turbine pump, turbine pump troubles and remedies

Unit-5 Submersible pump- Pump construction and operation, axial flow and mixed flow type propeller pump, Air lift pump-Principle of working air lift pumps, pumping, power requirement and efficiency

References:

1. Principles of drip irrigation system by M.S.Mane, B.L.Ayare published by Jain brothers
2. Practical Agricultural Engineering by Ghosh R. K. and Swain S. Vol. I & II., Naya Prakash, Calcutta (1993)
3. 'Soil & Water Conservation Engineering' by Suresh R. Standard Publishers & Distributors, (1997)
4. 'Principals of Agricultural Engineering' by A. M. Michael & T. P. Ozha by Jain Publishers Vol. I & II.
5. Irrigation - Theory & Practice by Michael A. M. (1998) - Vikas Publishing House, New Delhi.
6. 'Watershed Management' by Dhruvanarayan V. V. &Shastri G. &Patnaik U. S. ICAR Publication 1989.
7. Principles of agricultural engineering vol. I & II by A. M. Michel, T.P.Ojha

SWC 247 Practical on irrigation wells

Credit Point: 03 **Total Lecture: 45**

1. Selection of site for suitable location of well.

2. Study of different methods of drilling tube wells.

3. Study of Testing of yields of tube wells.

4. Study of Hydraulics of open wells.

5. Field visit – I

6. Field visit- II

7. Report writing on field visit

SWC 248 Irrigation pumps

Credit Point: 03 **Total Lecture: 45**

1. Study of Classification of water lifting devices

2. Study of classification of Centrifugal pumps

3. Criteria for Selection of centrifugal pumps

4. Points to be considered while Installation of centrifugal pumps

5. Field Visit –I

6. Field Visit –II

7. Report writing on field visit

SWC 249 Pump and pumping system

Credit Point: 03 **Total Lecture: 45**

1. Study of troubles in installation of centrifugal pumps

2. Study of classification of pumps

3. Study of electrical connections for pumps

4. Study of pump drives

5. Study of cost of pumping

6. Field Visit –I

7. Field Visit –II

8. Report writing on field visit