



2026

Website: ouat.ac.in
 Email: registrar@ouat.ac.in
registrarouat@gmail.com
 ☎ 0674-2397818/919, Fax-0674-239742.

ଓଡ଼ିଶା କୃଷି ଓ ବୈଷୟିକ ବିଶ୍ୱବିଦ୍ୟାଳୟ, ଭୁବନେଶ୍ୱର, ଓଡ଼ିଶା

ODISHA UNIVERSITY OF AGRICULTURE & TECHNOLOGY,
 Bhubaneswar-751003, Odisha

□□□

No. E-II-II-07/2013 (part)/

16218

/UAT,

Dated. 09th October, 2026

ADVERTISEMENT

In revision to the advertisement No.6092/UAT, dated 18.04.2023, applications are invited from the eligible candidates for recruitment to the following vacant posts on contractual basis in different Krishi Vigyan Kendras (KVKs) under OUAT.

Sl. No.	Name of the post	No. of vacancy	Reservation of vacancy					PWD/E x-SM
			S.T	U.R	S.C	SEBC	Total	
1	2	3	4	5	6	7	8	9
A	Farm Manager	08	4 2 (w)	2	-	-	08	
B	Programme Assistant	12	4	5	1 2 (w)	-	12	
C	Stenographer	05	3 1(w)	1	-	-	05	
	Total	25	11 3(w)	08	1 2(W)	-	20 05(w)	

Abbreviation: ST = Schedule Tribe, SC = Schedule Caste, UR= Unreserved, SEBC= Socially and Educationally Backward Classes, W=Women,

The prescribed application form, information sheet containing the details of qualification, experience, scale of pay, plan of examination and other requirements in respect of each post, general information and instruction to the candidate can be downloaded from University website: www.ouat.ac.in. The application form complete in all respect along with self attested copies of all certificates, mark sheets of all examination passed should be sent to the Registrar, OUAT, Bhubaneswar: 751 003 by Speed Post /Registered post so as to reach on or before **5.00 PM of 12.11.2026**.

The envelope containing the application should be super scribed "**APPLICATION FOR THE POST OF** along with advertisement No. and date.

Applications received after due date and time shall not be entertained. The University shall not be held responsible for any loss or delay in postal transaction. Incomplete application shall be summarily rejected & no correspondence on that matter shall be entertained.

The candidates who have applied earlier for the above posts with reference to the advertisement 6092/UAT, dated 18.04.2023 need not apply again. However they may submit the supplementary information and documents in favour of their candidature by Speed Post /Registered post so as to reach the Registrar, OUAT, Bhubaneswar within due date.

Terms and conditions:

- (1) The KVK employees are Contractual Project Staff till 100% funding of ICAR continues.
- (2) The KVK employees are not entitled to terminal benefits and their service is coterminous with the Central project i.e. till the period 100% funds are made available by ICAR.
- (3) The State Government and OUAT will not shoulder any kind of liability pertaining to KVK or KVK employees.
- (4) The transfer of the KVK employees will be within the KVKs of OUAT only.

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- (5) On appointment, the candidate shall serve in the KVKs for a minimum period of 01 (one) year and appointee may furnish an Undertaking to this effect at the time of joining. In any eventuality, if the candidates intends to resign, he/she has to furnish 1 (one month) prior notice to the authority, failing which, he/she has to deposit 1 (one) month salary for acceptance of his/her resignation.
- (6) The candidate must have passed Odia as one of the subject upto 7th standard. The certificate to this effect must be attached with the application.

In the event of non-availability or availability of in-sufficient number of eligible women candidates belonging to any particular category in a year, the vacancies or as the case may be, such vacancies shall be filled up by the other gender candidate of that category.

The pay and pay scale is subject to change based on the pay and pay scale as will be notified / communicated by ICAR / Funding Agencies from time to time with its applicability in prospective manner.

Fees of the application and mode of payment:

The candidates are required to deposit a nonrefundable application fee of Rs.500/- (Rupees Five hundred) only for the post of Farm Manager / Programme Assistant and Rs. 300/- (Rupees Three hundred) only for the post of Stenographer in favour of Comptroller, OUAT, Bhubaneswar-751 003.

The application fees shall be deposited directly through Green Channel Counter (GCC)/ Internet Banking / Real Time Gross Settlement (RTGS) in the **Account No.** of the Comptroller, OUAT (A/C No. **10173711536** of State Bank of India, OUAT Campus Branch, Bhubaneswar, Branch Code 03341, Indian Financial System Code (IFSC Code No. SBIN 0003341). The candidate must attach duly signed photo copy of the deposit receipt along with the application form. **Other mode of payment for application fee shall not be considered.**

Evaluation of essential qualification & experience will be made strictly as per the advertisement and supporting documents to this effect must be submitted with the application form.

In-service candidate shall apply through proper channel. One has to submit advance copy of original application to avoid delay. One should produce '**No Objection Certificate**' (NOC) from the Employer within one month of last date of application failing which the candidature will not be considered. The proper channel copy must be submitted before the last date of application.

No TA/DA will be borne by the University to appear the **Written Test**. University reserves the right to cancel the selection process, if necessary, due to unforeseen circumstances or may not fill up the required number of posts or all posts so advertised without assigning any reason thereof.

Selection Procedure:

The selection is based purely on the marks secured in the written test for the post of Farm Manager and Programme Assistant.

For the post of Stenographer the mark secured in skill test will be added to the score obtained in the written test to prepare final merit list.

PLAN OF WRITTEN TEST

The candidate will have to appear the written test at the venue and time as will be intimated in due course.

Minimum marks required for qualifying written test

Category of candidate	Minimum qualifying marks
Un-reserved (UR)	50 %
SEBC	45 %
ST / SC/ PWD	40 %

Rules for Tie-Breaker: Wherever two or more candidates shall secure equal aggregate marks, the merit of the candidates shall be determined by applying the following tie breaker rules.

- Candidate securing more marks in written test shall be ranked higher
- In case where the marks secured in written test are equal, the candidate senior in age shall be ranked higher.
- In case where weightage at (a) & (b) above are equal, the tie shall be resolved considering the desirable qualification, if any and percentage of mark secured therein for the post of Programme Assistant and Farm Manager whereas, for the post of Stenographer percentage of marks secured in Degree programme shall be considered.

BY ORDER OF THE VICE-CHANCELLOR

09/10/2026
REGISTRAR

Memo No. 16219 /UAT

Dt. 09.10.2026

Copy forwarded to the Registrar, all Agricultural Universities of India/ Registrar of all Veterinary & Animal Science Universities of India / Registrar, P.G. School, IARI, New Delhi/ Director, IVRI, Izatnagar, Bareilly, Uttar Pradesh/ Director, NRRI, Cuttack/ C.A.U. Imphal, Manipur/ CAU, Pusa, Samastipur, Bihar/CAU, Jhansi, UP for information and necessary action.

09/10/26
Asst. Registrar (Estt.)

Memo No. 16220 /UAT

Dt. 09.10.2026

Copy forwarded to the all Deans/ Directors/ All Heads of the Department of constituent Colleges under OUAT / All Associate Director of Research of RRTTS/ All Senior Scientist and Head of KVK under OUAT / All Officer-in-charge of Research Stations/ Schemes / Chief Librarian, Central Library, OUAT / Controller of Examination, OUAT for information and request to circulate the advertisement for wide publication.

09/10/26
Asst. Registrar (Estt.)

Memo No. 16221 /UAT

Dt. 09.10.2026

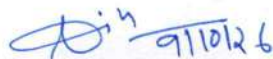
Copy forwarded to the Comptroller, OUAT, Bhubaneswar for information and necessary action.

09/10/26
Asst. Registrar (Estt.)

Memo No. 16222 /UAT

Dt. 09.10.2026

Copy forwarded to the Director, PME, OUAT, Bhubaneswar for information and necessary action. He is requested to upload the same in the OUAT website for wide circulation.


Asst. Registrar (Estt.)

Memo No. 16223 /UAT

Dt. 09.10.2026

Copy forwarded to the Director, ICAR-ATARI, Kolkata for information and necessary action.


Asst. Registrar (Estt.)

Cc to: Secretary to Vice-Chancellor, OUAT/ Section Officer, Cash, Accounts Section, OUAT/ Store Superintendent, Central Store, OUAT / Superintendent, Issue Section, OUAT/ Personal Assistant to Registrar / Notice Board.

SND*10-1

INFORMATION SHEET

Advertisement No.

/UAT

Dt.

- 1) Name of the post : Farm Manager
- 2) Nature of appointment : Contractual Project Staff
- 3) No. of vacancy : 08 (Eight)
- 4) Scale of pay : Rs. 35,400-1,12,400/- (7th Pay)
PB-2, Pay- Rs. 9,300/- - 34,800/-
Plus with GP Rs. 4,200/-(pre-revised Pay Band and Grade Pay in 6th CPC, or as prescribed by the Funding Agency from time to time).
- 5) Age
(as prescribed by the funding agency): Maximum 30 years as on last date of application. Age relaxation of 05 years in case of ST / SC/ SEBC/ Women category candidates and 10 years for Person with Disability as per Rule/ Act. The SEBC candidate should furnish 'Non-creamy layer certificate' for the current years.
- 6) Qualification :
 -  Essential Bachelor's Degree in Agriculture or any other branch of Science/ Social Science relevant to agriculture or equivalent qualification from a recognized University.
 -  Desirable Master's Degree in Agriculture or any other branch of Science/Social Science relevant to agriculture or equivalent qualification from a recognized University.
- 7) About Written Test The written test of 150 marks shall be conducted for 02 hours duration consisting of 150 multiple choice questions from relevant subjects. The outline of the syllabus is enclosed herewith (**Annexure-1**). The question paper includes the subject neutral common questions related to job profile (30 nos.) and subject specific question (120 nos.)

INFORMATION SHEET

Advertisement No.

/UAT

Dt.

- 1) Name of the post : Programme Assistant
- 2) Nature of appointment : Contractual Project Staff
- 3) No. of vacancy : 12 (Twelve)
- 4) Scale of pay : Rs. 35,400-1,12, 400/- (7th Pay)
PB-2, Pay- Rs. 9,300/- - 34,800/-
Plus with GP Rs. 4,200/-(pre-revised Pay
Band and Grade Pay in 6th CPC, or as
prescribed by the Funding Agency from time
to time).
- 5) Age
(as prescribed by the funding agency): Maximum 30 years as on last date of
application. Age relaxation of 05 years in case
of ST/ SC/ SEBC/ Women category
candidates and 10 years for Person with
Disability as per Rule/ Act. The SEBC
candidate should furnish 'Non-creamy layer
certificate' for the current years.
- 6) Qualification:
 - Essential : Bachelor's Degree in Agriculture or any other
branch of Science/Social Science relevant to
agriculture or equivalent qualification from a
recognized University.
 - Desirable : Master's Degree in Agriculture or any other
branch of Science/Social Science relevant
to agriculture or equivalent qualification
from a recognized University.
- 7) About Written Test : The written test of 150 marks shall be conducted
for 02 hours duration consisting of 150 multiple
choice questions from relevant subjects. The
outline of the syllabus is enclosed herewith
(Annexure-1). The question paper includes the
subject neutral common questions related to job
profile (30 nos.) and subject specific question
(120 nos.)

INFORMATION SHEET

Advertisement No.

/UAT

Dt.

- (1) Name of the post : Stenographer
- (2) Nature of appointment : Contractual Project Staff
- (3) No. of vacancy : 05 (Five)
- (4) Scale of pay : Rs. 25,500-81,100/- (7th Pay)
PB-1, Pay – Rs. 5,200/- - 20,200/- Plus
GP Rs. 2,400/-(pre-revised Pay Band and
Grade Pay in 6th CPC or as prescribed by the
Funding Agency from time to time)
- (5) Age
(as prescribed by the funding agency) : Maximum 27 years as on last date of
application. Age relaxation of 05 years in
case of ST/ SC/ SEBC/ Women category
candidates and 10 years for Person with
Disability as per Rule/ Act. The SEBC
candidate should furnish 'Non-creamy layer
certificate' for the current years.

(6) Qualification:

 Essential

12th Class Pass or equivalent qualification from
a recognized Board or University.

 Professional
Efficiency

The candidates will be given one
dictation test in English or in Hindi or Odia (as
per the choice of the candidates at 80 wpm for
10 mins (25 marks). The candidates who opt to
take the test in English will be required to
transcribe the matter in 50 minutes on computer
and candidates who opt to take the test in Hindi
or Odia will be required to transcribe the matter
in 65 minutes on computer (25 marks).

The written test of 150 marks shall be
conducted for 02 hour duration consisting of
150 objective multiple-choice question from
General English, General Awareness, and
Quantitative Aptitude (50 marks from each field).

7) About Written Test
(150 marks):

8) Skill Test (50 marks)

The candidate shall be called for the
Skill Test at 1:4 ratio from the merit list
prepared considering the written test. Skill test
of Stenography shall be conducted to meet the
requirement as detailed under professional
efficiency. The final merit list shall be prepared
considering both the marks obtained in written
test and skill test taken together.

Application form

ODISHA UNIVERSITY OF AGRICULTURE & TECHNOLOGY
Bhubaneswar-751003, Odisha



APPLICATION FORM

Affix signed
Passport size
recent color
photographs

Advertisement No. /UAT, dated.....

Application for the Post of.....

1. Name of the Bank.....
2. Amount(Rs.).....(Rupees.....)only
(attached original counterfoil of required amount duly signed by the candidate in support of evidence)

PERSONAL HISTORY

(1) Full Name of the candidate :
(in block capital)

(2) Address for communication (3) Permanent address
.....
.....
.....

Pin- Pin-
Telephone:..... Telephone:.....
Mobile:..... Mobile:.....
E-Mail ID:..... E-Mail ID:.....

(Any change of address should be reported in writing at once to the Registrar, OUAT, Bhubaneswar)

- (4) Date of birth (As recorded in the ICSE/ CBSE/ High School Certificate) :
- (5) Birth Place:.....
Home State:..... Home Town:.....
- (6) Nationality:
- (7) Sex:(Male / Female)..... (8) Mother tongue:.....
- (9) Marital Status: Single.....Married.....Widow(er).....
(If Married whether he has got two wives)
- (10) Whether belongs to ST.....SC.....SEBC.....PWD.....Other.....
(Attached authenticate Caste Certificate from the competent authority)

(11) **Language Known**

Language Proficiency	Speak	Read	Write

(12) Any medical disability (pl. Specify) :

(13) Father's/Husband's Name, :

Occupation/ and address :

(14) Educational qualification:

	Name of the Examination	Name of Board/ University	Division/ percent/ Final grade/	Field of specialization		Year of joining	Year of passing	Subject taken in Hons /distinction
				Major	Minor			
(i)	Matriculation							
(ii)	Intermediate							
(iii)	Bachelor Degree (Not essential for Stenographer)							

Photo copies of certificates & transcripts must be attached in support of evidence for consideration of candidature.

(15) Experience (Employment Record)

a) Experience regarding previous and present employment (Attach the certificate/ orders, if any)

Name and nature of post or appointment of	Date of joining	Date of leaving	Salary drawn (Basic Pay)	Employer's name and address	Reason for leaving service

Total Experience: Year----- Month----- Days-----

(16) Name, address and profession of two (02) referees who should be responsible persons not related to the candidate or connected with his/her school or college but well acquainted with his/ her personal life.

Name of the referees	Full Address and telephone number	Period, he has known the candidate
(1)		
(2)		

(17) Whether, you have been punished/ dismissed or convicted by any institution/ Govt./Court, if yes please give details on separate sheet : Yes.....No.....

(18) If appointment is offered, when can the

candidate join the post

(19) Details of enclosures: :

DECLARATION

I hereby declare that the information furnished above is true and correct to the best of my knowledge and belief

Place:
Date:

Full signature of the applicant

FORUSEOFIN-SERVICEAPPLICANT
(Certificate to be given by the Head of Institution/Office or Employer)

Certified that Dr./ Shri./ Smt./ Kumari.....

Is working as..... in this
Department / Office / Institute / Organization. I have no objection to his / her application being considered
for this post. He/ She will be relieved as per rules, if he/she is selected for the said post. The information
furnished in the application are verified.

No.....

Dated.....

Signature:.....

Designation:.....

Office Stamp:.....

DETAILSOFENCLOSURES

(1)

(6)

(2)

(7)

(3)

(8)

(4)

(9)

(5)

(10)

GENERAL INFORMATION AND INSTRUCTION TO CANDIDATE

(To be retained by the Candidate)

INSTRUCTIONS (Important)

1. Before filing /submitting the application form, candidates are advised to go through the qualification prescribed for the post and make sure that he/she possesses the same.
2. Please make sure that all the entries in this form are written down neatly and legibly.
3. The application should be:
 - i. Completed in all respect.
 - ii. Supported with self-attested copies of all Certificates from H.S.C. onwards.
 - iii. Routed through proper channel (in case of persons already in service).
4. Original counter foil of the fees deposited for the post with duly signed by the candidate.
5. In-complete application shall not be considered.
6. The application must reach the Registrar, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar-751003, Odisha on or before the last date and time prescribed for receipt of applications. Application received after the last date and time shall stand rejected automatically.
7. To avoid delay in the receipt of the application through proper channel, the candidate is advised to submit an advance copy of his/her application (Complete in all respect) before the closing date and time by Regd. post.
8. Application without the prescribed fees with original counter foil and other mode of payment, shall be rejected.

GENERAL INSTRUCTIONS /INFORMATION

(A) FILLING THE FORM

- (1) Documentary proof in support of experience and academic qualifications indicated in the application form should be attached along with the application form failing which the application shall be treated as in-complete and will be rejected.
- (2) Complete name of the post and for which the candidate is applying should be written clearly.
- (3) Two recent passport size color photograph should be pasted on the application form in the space provided for the purpose.

(B) REGARDING FEES :

Rs 500/- (Rupees five hundred) only – Farm Manager / Programme Assistant.

Rs. 300/- (Rupees three hundred) only – Stenographer

Mode of payment

The application fees shall be deposited directly through Green Channel Counter (GCC)/ internet banking / real time gross settlement (RTGS) in the **Account No.** of the Comptroller, OUAT (A/C No. **10173711536** of State Bank of India, OUAT Campus Branch, Bhubaneswar, Branch code 03341, Indian Financial System Code (**IFSC Code No. SBIN 0003341**). In support of documents regarding deposit, the candidate should attach duly signed photo copy of the deposit receipt along with the application form. **Other mode of payment for application fee shall not be considered.**

(C) MAILING THE APPLICATION FORM:

- (1) The application form along with all relevant documents should be sent to the "Registrar, Odisha University of Agriculture & Technology (OUAT), Bhubaneswar-751003", Odisha
- (2) The application form should be sent under Speed Post/ Registered Post.

(D) NOTICE :

- (a) The furnishing of false information or suppression of any factual information in the application would be a dis-qualification and candidate will not be considered for employment under this University. Any such false information comes to the notice of the Authority at anytime during service period of person, his service would be liable to be terminated.
- (b) No correspondence will be entertained from the candidates in connection with the process of selection /test/ interview/ appointment. Canvassing in any form will be a disqualification.

B.V.Sc. & A.H.

- Common animal husbandry terms. (glossary) Body conformation and identification. Transportation of livestock animals. Common farm management practices including disinfection, isolation, quarantine and disposal of carcass. Introduction to methods of drug administration.
- Common vices of animals (Cattle, Buffalo, Sheep, Goat), their prevention and care.
- Preparation of animals for show. Culling of animals. Selection and purchase of livestock.
- Agronomical Practices for fodder production. Important leguminous and non-leguminous fodders in different seasons.
- Scarcity fodders and preservation of green fodder. Recycling of animal washings and wastes in fodders production and use of recycle waste.
- Housing systems, layout and design of different buildings for animals. Selection of site.
- Breeds of cattle and buffalo and descriptions of important breeds. Economic traits of cattle and buffaloes.
- General management and feeding practices of calves, heifers, pregnant, lactating and dry animals, bulls and working animals. Draught ability of cattle and buffaloes.
- Routine animal farm operations and labour management. Animal farm accounts and records.
- Methods of milking and precautions. Factors affecting quality and quantity of milk production. Clean milk production.
- Breeds of sheep and goat and their descriptions.
- General management and feeding practices during different stages of growth, development and production (milk, meat and wool).
- Breeding schedule and management of ram and buck. Weaning and fattening of lambs and kids.
- Protection and welfare of performing animals. Welfare of animals during transportation. Animal welfare in commercial livestock farming practices. Protection and welfare of working animals.

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- Classification of poultry with respect to production characters, age and standards. Production characters of other avian species
- Specific strains developed for rural poultry production; their acceptability and importance in rural eco-system.
- Brooding management – Types of brooders – preparation of shed – Importance of environmental factors.
- Housing – Types of poultry houses – space requirements.
- Recent advances in housing systems and rearing systems.
- Deep litter management – control of litter-borne diseases and recycling of litter. Cage management – Different types; Advantages and disadvantages.
- Management of growers and layers. Management of broilers and breeders.
- Stress management.
- Feeding management – Classification of nutrients – Nutrient requirements and feed formulations. Feeding systems – Feed restrictions – phase feeding – Additives and supplements.
- Water management. Breeding systems and methods of mating. Selection and culling. Breeding for specific characters and for hybrid chicken production.
- Bio-security and principles of disease prevention management. Health care for common poultry diseases – vaccination. General principles of poultry medication.
- Principles of incubation and hatchery management practices. Factors affecting fertility and hatchability, selection and care of hatching eggs and hatchery hygiene.
- Candling, sexing, grading, packing and disposal of hatchery waste.
- Economics of hatchery business – Troubleshooting hatchery failures – Computer applications in hatchery management. Poultry waste management, pollution and environmental issues.
- Management of ducks, geese, turkeys, Japanese quails, guinea fowls etc.

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- Important swine breeds (exotic and indigenous) & their characteristics. Housing and feeding of swine. Management of different categories of swine for optimal production: breeding and pregnant sows; sows at farrowing and after farrowing: pig-lets, growing stock, lactating sows, feedlot stock.
- Diagnosis, prevention and control of bacterial & fungal diseases caused by following bacteria & fungi:

Staphylococcus; Streptococcus; Corynebacterium, Listeria; Bacillus; Mycobacterium; Clostridium, Actinomyces, Streptomyces and Dermatophilus; Family Enterobacteriaceae (E.coli, Klebsiella, Salmonella, Yersinia); Pseudomonas, Pasteurella, Actinobacillus and Haemophilus, Brucella; Vibrio; Campylobacter; Bordetella and Moraxella; Gram negative anaerobes: Bacteriodes, and Fusobacterium; Leptospira and other Spirochaetes; Mycoplasma, Coxiella, Neorickettsia, Ehrlichia, Anaplasma, Rickettsia; Chlamydia.

Candida and Cryptococcus; Aspergillus; Dermatophytes and Malassezia; Mycotic mastitis and mycotic abortion; Mycotoxicoses

- Concept of Immunity to Microbes, Vaccines
- Prevention and Control of following Viruses and Prions Causing Diseases in Livestock and Poultry: Infectious bursal disease virus;, Bluetongue virus, *Paramyxoviridae*: Newcastle disease virus, PPR virus; *Rhabdoviridae*: Rabies virus, Ephemeral fever virus, *Coronaviridae*: Infectious Bronchitis virus, Transmissible gastroenteritis virus; *Picornaviridae*: FMD virus, Duck viral hepatitis virus; *Flaviviridae*: Swine fever virus, BVD virus; *Retroviridae*: Visna or maedi virus. *Poxviridae*: Capripoxvirus, Avipoxvirus, Cowpoxvirus; *Asfarviridae*: African Swine Fever Virus; *Herpesviridae*: Bovine herpes viruses, Infectious laryngotracheitis virus, Marek's disease virus, Pseudorabies virus, Malignant Catarrhal Fever virus; Duck Plague virus, *Adenoviridae*: Egg Drop Syndrome virus, Fowl adenovirus, *Papillomaviridae*: Papillomatosis, *Circoviridae*: Chicken Anemia Virus: Prions: Scrapie, Bovine Spongiform Encephalopathy; Emerging, re-emerging and transboundary viruses and Viral Infections.
- Pathological changes of nutritional imbalances (in brief) due to carbohydrates, proteins, fats, minerals and vitamins and metabolic diseases (pregnancy - toxemia, post-parturient

haemoglobinuria, hypomagnesemic tetany, azoturia, and sway back or enzootic ataxia, pica and Rheumatism like syndrome).

- Gross and microscopic pathology (brief) of toxicities like arsenic, copper, lead, mercury, cadmium, strychnine, nitrate or nitrite, hydrocyanic acid, fluoride, selenium and oxalates; insecticide or pesticide poisoning, plant poisoning (bracken fern, gossypol, ratti and lantana)
- Avian Inflammation, Viral Diseases: Pathogenesis, gross and microscopic pathology of Ranikhet disease, infectious bursal disease, infectious bronchitis, infectious laryngotracheitis, fowl pox, avian influenza, Marek's disease, leukosis or sarcoma group of diseases, reticuloendotheliosis, avian encephalomyelitis, inclusion body hepatitis, hydro-pericardium syndrome, chicken infectious anaemia, avian nephritis, egg drop syndrome, reovirus infections.
- Bacterial Diseases: Pathogenesis, gross and microscopic pathology of colibacillosis, infectious coryza, clostridial diseases, salmonella infections, fowl cholera, tuberculosis and spirochaetosis. Pathogenesis, gross and microscopic pathology of *Mycoplasma* infections, chlamydiosis. Pathogenesis, gross and microscopic pathology of aspergillosis, thrush, favus, aflatoxicosis, ochratoxicosis and trichothecosis.
- Gross and microscopic pathology of nutritional imbalances due to carbohydrates, proteins, minerals and vitamins. Miscellaneous diseases (Heat stroke, vent gleet, internal layer, false layer, pendulous crop, breast blister, ascites syndrome, fatty liver and kidney syndrome, fatty liver syndrome, cage layer fatigue, gout, hemorrhagic syndrome, round heart disease, impaction of oviduct, egg bound condition, bumble foot) and common vices.
- Computer Application: Introduction to computer languages. Data Base Management. Review of MS-Office and its components (MS-Word, Excel, Power Point and Access). Analysis of data using MS-Excel. Concepts of computer networks, internet & e-mail.
- Methods of conservation- livestock and poultry conservation programmes in the state and country. Application of reproductive and biotechnological tools for genetic improvement of livestock and poultry. Breeding for disease resistance.
- Importance of nutrients in animal production and health. Composition

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of animal body and plants. Nutritional terms and their definitions. Nutritional aspect of carbohydrates, protein and fats. Role and requirement of water, metabolic water. Importance of minerals (major and trace elements) and vitamins in health and production, their requirements and supplementation in feed. Common feeds and fodders, their classification, availability and importance for livestock and poultry production.

- Processing of concentrates and roughages. Various physical, chemical and biological methods for improving the nutritive value of inferior quality roughages.
- Preparation, storage and conservation of livestock feed through silage and hay and their uses in livestock feeding. Harmful natural constituents and common adulterants of feeds and fodders. Feed additives in the rations of livestock and poultry and their uses.
- Factors affecting digestibility of a feed. Feeding standards, their uses and significance, merit and demerits of various feeding standards with reference to ruminants. Balanced ration and its characteristics.
- General principles of computation of rations. Formulation of rations and feeding of dairy cattle and buffaloes during different phases of growth and production (neonate, young, adult, pregnant, lactating and dry animals; breeding bull) and working animals.
- Formulation of ration and feeding of sheep and goat during different phases of growth and production (milk, meat and wool). Feeding of high yielding animals and role of bypass nutrients. Metabolic disorders and nutritional interventions. Use of NPN compound for ruminants.
- Nutrient requirements in poultry, swine. Energy and protein requirement for maintenance and production. Methods adopted for arriving at energy and protein requirements for maintenance and production in terms of growth, reproduction and production (egg, meat and work).
- Feeding standards for non-ruminants and poultry. Formulation of rations as per Bureau of Indian Standards and Indian Council of Agricultural Research specifications. Feeding of swine (Piglets, Growers, Lactating and pregnant sows, Breeding boar, Fattening animals) and poultry (Starter, Growers, Broilers, Layers) with conventional and unconventional feed ingredients.

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- Feeding of ducks, quails, turkeys. Metabolic disorders and nutritional intervention.
- General approaches to diagnosis and treatment of poisoning. Toxicity caused by metals and non-metals: Arsenic, lead, mercury, copper, molybdenum, selenium, phosphorus, fluoride, nitrates or nitrites, chlorate, common salt and urea. Poisonous plants: Cyanogenetic plants, abrus, ipomoea, datura, nux vomica, castor, oxalate producing plants, plants causing thiamine deficiency, plants causing photosensitization and lathyrism, oleander, and cotton.
- Toxicity caused by Agrochemicals: Insecticides - Chlorinated hydrocarbons, organophosphates, carbamates, pyrethroids, newer insecticides. Herbicides, fungicides and rodenticides. Fungal and bacterial toxins: Aflatoxins, rubratoxin, ochratoxin, sporidesmin, citrinin, F-2 toxin, trichothecenes, ergot, fescue, botulinum toxin and tetanus toxin. Venomous bites and stings: Snake, scorpion, spider, bees and wasp, toad and fishes (puffer fish, shellfish). Toxicity caused by food additives and preservatives. Drug and pesticide residue toxicology. Environmental pollutants: Air and water pollutants. Concept of radiation hazards.
- Principles and concepts of food hygiene and safety. Hygienic and safe milk production practices including steps for prevention and control of milk contamination, adulterants, antimicrobial residues, agrochemicals, subclinical mastitis or udder infections, etc. Milk plant and dairy equipment hygiene. Quality control of milk and milk products. Milk hygiene practices in India and other countries.
- Factors influencing occurrence of livestock diseases and animal production. Determinants of disease. Transmission and maintenance of infections. Survey and surveillance of animal diseases and related parameters. Economics of animal diseases
- Multisectoral approach for zoonoses prevention and control.
- Disaster management and mitigation. Solid and liquid waste management at farms and biomedical waste management. Sanitation and disinfection of farm environment for infection control. Management of waste from animals. Stray and fallen animal management and carcass disposal.
- General control measures against parasites. Characters of various phyla

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of parasites.

- Diagnosis and management of the following nematode parasites: *Ascaris*, *Parascaris*, *Toxocara*, *Toxascaris*, *Ascaridia*, *Heterakis* and *Oxyuris*. *Strongyloides*, *Strongylus*, *Chabertia*, *Syngamus* and *Oesophagostomum*. Kidney worms (*Stephanurus* and *Dioctophyma*), hook worms (*Ancylostoma* and *Bunostomum*). *Trichostrongylus*, *Ostertagia*, *Cooperia*, *Nematodirus*, *Haemonchus* and *Mecistocirrus*. *Habronema*, *Draschia*, *Thelazia*, *Spirocerca*, *Gongylonema*, *Physaloptera* and *Gnathostoma*. *Dirofilaria*, *Parafilaria*, *Onchocerca*, *Setaria* and *Stephanofilaria*. Lung worms (*Dictyocaulus*, *Muellerius*, *Protostrongylus* and *Metastrongylus*). Guinea worm (*Dracunculus*), *Trichinella*, *Trichuris*, *Capillaria*. *Acanthocephala* (*Macracanthorhynchus*). Study of anthelmintic resistance and its types.
- Pathogenesis and control of following arthropods affecting animals and birds: Bugs (*Cimex*). Biting midges (*Culicoides*), black flies (*Simulium*), sandflies (*Phlebotomus*), mosquitoes (*Culex*, *Anopheles* and *Aedes*). Horse flies (*Tabanus*), *Haematopota* and *Chrysops*. *Musca*, *Stomoxys*, *Haematobia* and *Sarcophaga*. Warbles (*Hypoderma*), stomach bots (*Gasterophilus*, *Cobboldia*), nasal bots (*Oestrus* and *Cephalopina*), Bottle flies (*Calliphora*, *Lucilia*, *Chrysomya*), myiasis. *Hippobosca*, *Melophagus*, *Pseudolynchia*. Lice (*Haematopinus*, *Linognathus*, *Trichodectes*, *Damalinia*, *Menopon*, *Lipeurus*, *Menacanthus* and *Heterodoxus*). Fleas (*Ctenocephalides*, *Echidnophaga*, *Xenopsylla*, *Pulex*). Arachnids: General account, soft ticks (*Argas*, *Ornithodoros* and *Otobius*). Hard ticks (*Hyalomma*, *Haemaphysalis*, *Rhipicephalus* (*Boophilus*), *Dermacentor*, *Ixodes* and *Amblyomma*). Mites (*Dermanyssus*, *Ornithonyssus*, *Demodex*, *Notoedres*, *Sarcoptes*, *Psoroptes*, *Chorioptes*, *Cnemidocoptes* and *Otodectes*). Pentasomida (*Linguatula*). Study of insecticide or acaricide resistance.
- Composition and nutritive value of milk and factors affecting composition of milk. Physico-chemical properties of milk. Microbiological deterioration of milk and milk products.
- Different ongoing central and state government animal husbandry development programmes being run related to sheep, goat, poultry, piggery, fodder production etc.
- Introduction to Livestock Economics: definition and scope (production,

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consumption, exchange and distribution). Basic concepts- wants, goods, wealth, utility, price, value, assets, capital, money, income etc. Theories of demand, supply and cost. Theories of production (law of diminishing return, increasing return, constant return and return to scale). Market price and normal price, price determination under perfect competition in short and long run.

- Theories of entrepreneurship: Sociological theory, economic theory, cultural theory, psychological theory. Types, characteristics and functions of an entrepreneur. Forms of entrepreneurship: (Sole proprietorship, partnership, corporation, cooperative, joint stock company, Private and Public Limited Company).
- Introduction to financial management: concept, function, analysis of financial statement, sources of capital (banks, venture capitals, etc.). Project appraisal-Introduction, importance, techno-economic feasibility, criteria of project evaluation (discounted and non-discounted), capital budgeting, etc.
- Business plan for enterprise. Institutions promoting entrepreneurship in India. Entrepreneurship development programmes. Accounting: objectives, common terms. Personnel management-identification of work, job analysis, division of labour etc. Resource management-organization aspect of livestock farms, resources and procurement of inputs and financial resources, break-even-analysis etc.
- Etiology, clinical manifestations, diagnosis, differential diagnosis, treatment, prevention and control of important diseases of cattle, buffalo, sheep, goat, pig, and poultry: Diseases of digestive, respiratory, cardiovascular, urinary, nervous, musculoskeletal, haemopoietic, and lymphatic systems, skin, sense organs including affection of peritoneum, liver and pancreas. Emergency medicine and critical care.
- Diagnosis and management of diseases caused by deficiency of iron, copper, cobalt, zinc, manganese, selenium, calcium, phosphorus, magnesium, iodine, vitamin A, D, E, B complex, K and C. Diseases of neonates, Alternative or integrated or ethno veterinary medicine in animal disease management.

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- Sexual behaviour and libido - Sperm transport, erection and ejaculation - Coital injuries and vices in male animals- Semen and ejaculate - Semen collection techniques- Structure of Spermatozoa- Semen evaluation- Semen extenders, dilution, preservation and post thaw evaluation -
- Artificial insemination techniques in farm and pet animals - Forms of male infertility- Impotentiacoecundi and impotentiagenerandi - Affections of the scrotum, testis, accessory sex glands, penis and prepuce- Breeding soundness evaluation of bull - *In vitro* tests for evaluation of male fertility- Medical and surgical techniques for population control of the male reproduction - Surgical procedure on the male reproductive tract in farm animals.

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College of Vety. Sc. & A.H.
OUAT, BHUBANESWAR-3

B.SC (HONS.) HORTICULTURE

- Nursery techniques and their management, vegetable gardens, nutrition and kitchen garden and other types of gardens – principles, planning and layout, management of orchards, planting systems and planting densities.
- Production and practices for fruit, vegetable and floriculture crops. Types and methods of pruning and training of fruit crops, types and use of growth regulators in horticulture, water management– irrigation methods, weed management, fertility management in horticultural crops-manures and fertilizers, different methods of application,
 - Cropping systems, intercropping, multi-tier cropping, mulching– objectives, types merits and demerits, Classification of bearing habits of fruit trees, factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working, principles of organic farming, market chain management.
 - Sexual and asexual methods of propagation, Propagation Structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons nursery, use of growth regulators in seed,
 - Methods and techniques of division-stolons, pseudo-bulbs, offsets, runners, cutting, layering, grafting, formation of graft union,
 - Media for propagation of plants in nursery beds, potting and repotting. Preparation of nursery beds and sowing of seeds. Raising of rootstock. Seed treatments for breaking dormancy and inducing vigorous seedling growth.
 - Preparation of plant material for potting. Hardening plants in the nursery. Preparation of plant growth regulators for seed germination and vegetative propagation.
 - Tropical and Sub-Tropical Fruits: varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards.

- Physiological disorders. Post-harvest technology, harvesting methods, grading, packaging and storage of the following crops. Mango, banana, citrus, papaya, sapota, guava, pomegranate, bael, ber, amla, anona, pineapple, jackfruit, litchi, carambola, rose apple.
- Bearing in mango and citrus, causes and control measures of special production problems, alternate and irregular bearing overcome, control measures. Seediness and kokkan disease in banana, citrus decline and casual factors and their management.
- Orchard & estate management, sod culture, Sod mulch, herbicides and inorganic and organic mulches. Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems.
- Rejuvenation of old orchards, top working, frame working, Integrated nutrient and pest management.
- Climate aberrations and mitigation measures of Horticultural crops.
- Layout of different systems of orchard and estate, soil management, clean, inter, cover and mixed cropping, fillers. Use of mulch materials, organic and inorganic, moisture conservation, weed control.
- Plantation Crops: planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, nutrition, weed and water management, training, pruning use of growth regulators, soil management, liming practices, tipping practices, top working, yield and economics of coconut, arecanut, oil palm, cashew nut, date palm and rubber.
- Weed management in major field and horticultural crops, Herbicide classification, formulations, methods of application
- Methods of reducing evapotranspiration, use of shelter belts, mulches, anti-transpirants, growth regulators, etc. micro systems of irrigation etc. *in-situ* grafting, deep pitting/planting, canopy management, different types of tree basins, etc.
- Tropical and Sub-tropical Vegetable Crops: climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly

- sown/transplanted vegetable crops. Spacing, planting systems, nutrient, water and weed management; nutrient deficiencies, use of chemicals and growth regulators.
- Cropping systems, harvest, yield, post-harvest handling, economics and marketing of tropical and sub-tropical vegetables such as tomato, brinjal, chillies, capsicum, okra, amaranthus, cluster beans, cowpea, lab-lab, cucurbits, moringa and curry leaf.
 - Soil and climate, propagation-seed, vegetative and micropropagation systems and methods of planting of spices & condiments. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products of Cardamom, pepper, betel vine ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, vanilla, thyme and rosemary.
 - Seed Production of Vegetable, Tuber and Spice Crops Differences between grain and seed. Principles of vegetable seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging, seed extraction and storage of cole crops, root vegetables, solanaceous vegetables, cucurbits, okra, leafy vegetables, bulb crops, leguminous vegetables and exotic vegetables.
 - Temperate Vegetable Crops: Climate and soil, production technologies, post-harvest technology and Marketing of cabbage, cauliflower, knol-khol, sprouting broccoli, Brussels' sprout, lettuce, palak, Chinese cabbage, spinach, garlic, onion, leek, radish, carrot, turnip, beet root, peas, broad beans, asparagus. Propagation methods, nursery management;
 - Economic importance of potato and tropical and sub-tropical tuber crops; Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of

cultivation. Post-harvest handling and storage of potato, sweet potato, arrow root, cassava, colocasia, amorphophallus, dioscorea, and other under exploited tuber crops.

- Precision farming – laser leveling, mechanized direct seed sowing; transplanting, site specific input application, weed, insect pests and disease management, types of Green Houses, Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, passive solar green house, hot air greenhouse heating systems, green house drying. Choice of crops for cultivation under greenhouses. Growing media, soil culture, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics.
- Importance of Postharvest Technology in horticultural crops. Maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, spices, medicinal and aromatic plants. Postharvest treatments of horticultural crops. Quality parameters and specifications. Types of containers and cushioning materials.
- Fruit and vegetable preservation: Principles and methods of preservation by heat - pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrups, cordials and fermented beverages. Jam, jelly and marmalade. Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives, preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms, freezing preservation. Canning of fruits and vegetables, preparation of squash, RTS, cordial, syrup, jam, jelly, marmalade, candies, preserves, chutneys, sauces, pickles (hot and sweet). Dehydration of fruits and vegetables – tomato product dehydration, refrigeration and freezing, Processing of plantation crops.
- General cultivation aspects for ornamental plants viz. Annuals, biennales herbaceous perennials, grasses and bulbous ornamentals. shrubs, climbers, trees, indoor plants, palms, cycads, ferns, cacti and

succulents, etc. Design and establishment of garden features/components viz. hedge, edge, borders, flower beds, paths, drives, fences, garden walls, gates, shade garden, roof garden, terrace garden, pebble garden, rockery, avenue planting.

- Lawn types, establishment and maintenance. Importance of flower arrangement, Ikebana, techniques, types, suitable flowers and cut foliage, uses of vertical garden, bottle garden, terrariums, art of making bonsai, culture of bonsai and maintenance.
- Basic themes of gardens viz. circular, rectangular and diagonal themes, development of institutional gardens, planning and planting of avenues
- Production techniques cut flowers of rose, marigold, chrysanthemum, orchid, carnation, gladiolus, jasmine, crossandra, anthurium, dahlia, tuberose, bird of paradise, china aster and gerbera production techniques of flowers and foliage filler materials growing of flowers under protected environments such as glass house, plastic house etc., postharvest technology of cut flowers dehydration technique for drying of flowers.
- Propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of important medicinal and aromatic plants viz. Withania, periwinkle, Rauvolfia, Dioscorea, Isabgol, Belladonna, Cinchona, Pyrethrum and other species relevant to local conditions. Aromatic Plants: Citronella grass, khus grass, geranium, patchouli, bursera, menthe, musk, occimum and other species relevant to the local conditions.
- Plant diseases: symptoms, signs and related terminology. Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants). Survival and dispersal of plant pathogens. Principles and methods of plant disease management. Integrated plant disease management. Fungicides classification based on chemical nature, Commonly used fungicides, bactericides and nematicides.

- Integrated management of the diseases of fruits, plantation, medicinal and aromatic crops viz mango, banana, citrus, guava, sapota, papaya, jack fruit, pineapple, pomegranate, ber, strawberry, areca nut, coconut, oil palm, cashew, rubber, betel vine, senna, belladonna, pyrethrum, camphor, crotalaria, datura, dioscorea, mint, opium, *Solanum khasianum* and Tephrosia.
- Integrated management of diseases of tomato, brinjal, chilli, bhindi, cabbage, cauliflower, radish, knol-khol, pea, beans, beet root, onion, garlic, fenugreek, ginger, potato, turmeric, pepper, coriander, clove, cinnamon, jasmine, rose, crossandra, tuberose, gerebera, anthurium, geranium.
- Integrated management of important insect pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops like coconut, areca nut, oil palm, cashew, cacao, tea, coffee, cinchona, rubber, betel vine senna, neem, belladonna, pyrethrum, costus, crotalaria, datura, dioscorea, mint, opium. Insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their maximum residue limits (MRLs).
- Bee colony maintenance, bee colony activities, starting of new colony, location site, transferring colony, replacement of queen, combining colonies, swarm prevention, colony management in different seasons, Equipment for apiary, types of bee hives and their description. Bee pasturage. Honey extraction, honey composition and value, bee wax and tissues.
- Pest surveillance in important vegetable, ornamental and spice crops. Integrated management of important insect-pests affecting vegetable, ornamental and spice crops. Important storage insect-pests of vegetable, ornamental & spice crops and their integrated management. Insect –pests of processed vegetables and ornamental crops and their integrated management. Insecticidal residue problems in vegetables and ornamental crops, tolerance limits etc.

1. ~~Agri-Net New Delhi~~ Periodical Expert Book

- Methods of textural analysis, textural classes, use of textural triangle; absolute specific gravity/particle density/ bulk density of soil. Factors influencing, soil moisture, organic matter, soil structure, Management of Soil Crusting, Soil Compaction and Soil Compression. Soil Biology benefits and harmful effects. Remote sensing application in soil and plant studies.
- Essential plant nutrient elements- functions, deficiency systems, transformations and availability. Acid, calcareous and salt affected soils – characteristics and management. Soil organic matter, Role of microorganisms in organic matter- decomposition – humus formation. Importance of C:N ratio and pH in plant nutrition, soil buffering capacity. Integrated plant nutrient management. Soil fertility evaluation methods, critical limits of plant nutrient elements and hunger signs. NPK fertilizers: composition and application methodology, deficiency symptoms, visual diagnosis. Plant nutrient toxicity symptoms and remedies measures. Soil test crop response and targeted yield concept. Biofertilizers. Nutrient use efficiency and management. Secondary and micronutrient fertilizer.
- Natural Resources: Renewable and non-renewable resources. Natural resources and associated problems: a) Forest resources b) Water resources, c) Land resources, Hot-spots of biodiversity. Threats to biodiversity - habitat loss, In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of - Air, Water, Soil. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.
- Natural Disasters- Floods, drought, cyclone, heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. air pollution, water pollution, deforestation.
- Methods of soil and plant sampling and processing for analysis. Soil micro-organisms and their importance. Saline, alkali, acid, waterlogged and sandy soils management. Rapid tissue tests for soil and plant. Management of poor quality irrigation water in crop management.

- Understanding of performance and efficiency of tractors, power tillers and their types and uses. Electric motors: types, Primary tillage implements: indigenous ploughs, improved indigenous ploughs, mould board ploughs, disc and rotary ploughs. Secondary tillage implements: tillers, harrows, levelers, ridgers and bund formers. Sowing and transplanting equipment: seed drills, potato planters, seedling transplanter. Grafting, pruning and training tools and equipment. Inter-culture equipment: sweep. Junior hoe, weeders, long handle weeders. Crop harvesting equipments: potato diggers, fruit pluckers, tapioca puller and hoists.
- Water Management in Horticultural Crops: Water requirement of horticultural crops, critical stages of crop growth for irrigation. Irrigation scheduling – different approaches – methods of irrigation – surface and sub-surface pressurized methods viz., sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, Layout of different irrigation systems, drip, sprinkler. Layout of underground pipeline system.
- Organic production requirements; organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Integrated diseases and pest management – use of biocontrol agents, biopesticides pheromones, trap crops, bird perches;
- Agroforestry system, sub-system and practice: agri-silviculture, silvipastoral, horti-silviculture, horti-silvipastoral, shifting cultivation, taungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations. Selection of tree species for agroforestry. Nursery and planting (*Acacia catechu*, *Dalbergiasissoo*, *Tectona*, *Populus*, *Morus*, *Grewia*, *Eucalyptus*, *Quercus* spp. and bamboo, tamarind, neem etc.).
- Concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cultural practices for raising major cereals, pulses, oil seeds and fodder crops, green manuring, crop rotation.

- Bar diagram, pie diagram, histogram, mean, mode, median, geometric mean, percentiles and quadriles for raw and grouped data. Dispersion: Range, standard deviation, variance, coefficient of variation for raw and grouped data. Experimental designs: completely randomized design, randomized block design, latin square designs, factorial experiments, analysis of factorial experiments up to 3 factors – split plot design, strip plot design, long term experiments, plot size, guard rows. Introduction to computers and Windows, MS Word, MS Excel, MS Power point-preparation, presentation of slides and slide show.
- Leaf area index (LAI) - optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves, Crop development and dynamics, growth analysis in horticultural crops. Plant bio-regulators- auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, Flowering-factors affecting flowering, photoperiodism-long day, short day and day neutral plants, vernalisation and its application in horticulture, physiological basis of training and pruning, seed dormancy and breaking methods in horticultural crops. Factors affecting fruit set and development, physiology of ripening of fruits-climatic and non-climacteric fruits.
- Difference between prokaryotic and eukaryotic cells. Prokaryotic cell structure and functions. Types of culture media and pre-culture techniques. Mushrooms- edible and poisonous types, nutritive values, Culturing and production techniques.
- Farm management principles and decision making, factors, product, relationship, optimum conditions, Farming systems and types: Steps and methods of planning,
- Horticulture extension: Motivation of Farmers, rural youth and voluntary organizations for Horticulture extension work. Audio – visual aids: importance, classification and selection. Adoption and diffusion process, Teaching and learning-concepts and principles, Teaching steps, Participatory Rural Appraisal (PRA) & Rapid Rural Appraisal (RRA).

- Entrepreneurship Development: SWOT analysis, Communication Skills: verbal and non-verbal communication; organizational and managerial skills, problem solving skills, field diary and lab record; indexing,

D. Sahas

11/08/26.

Prof. Vegetable Science
College of Horticulture
Diploma.

B.Sc. (Hons.) Community Science

- Natural resources- Renewable and non-renewable resources and their associated problems. Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.
- Biodiversity and its conservation- Threats to biodiversity- Habitat loss, In-situ and Ex-situ conservation of biodiversity. Environmental pollution- Definition, cause, effects and control measures of air, water, soil, pollution. Solid waste management. Water conservation, rain water harvesting,
- Natural disasters- floods, drought, cyclone, heat and cold waves, and effects. National disaster management framework. Feeding the people struck by the disaster, managing house and dress need during disaster.
- Climate and soil for horticultural crops; kitchen gardening; garden types and parts; medicinal and aromatic plants; spices and condiments
- Rural sociology- Meaning, scope and significance. Status of women in rural India and their role in rural and agricultural development.
- Introduction to computers, anatomy of computers, memory concepts, units of memory, operating system, definition and types. Application of MS-Office, data presentation, tabulation and graph creation, statistical analysis, uses of DBMS in health and nutrition.
- Classification and tabulation of data; qualitative and quantitative classification, discrete and continuous variables, frequency tables, grouped and ungrouped data. Diagrammatic representation of data; median and mode, variance, standard deviation, coefficient of variation. Tests of significance; one sample t-test and two sample fisher's t-test. Chi-square test. Analysis of variance;
- Major groups of microorganisms associated with food. Sources of microbial contamination in food. Factors affecting growth and survival of microorganism in food. Physical, Chemical methods to control microorganisms. Spoilage organisms of milk, meat, grains, fruits and vegetables. Principles of food preservation. Food poisoning and food borne infections. Microbial testing in food- Microscopic count and culture.
- Role of ICT in communication. Recent advances in communication- Print and electronic, internet, e-mail, mobile, interactive video and teleconferencing, computer, e-governance.

- Recommended dietary allowances; balanced diet; health; functional food; phytochemicals; nutra-ceuticals; dietary supplements. Carbohydrates- Types, functions, sources, requirement, health conditions affected by carbohydrates, significance of dietary fibre. Lipids- Types, functions, sources, requirement,
- Vitamins- Classification, functions, sources, requirement, deficiency and toxicity of the following- (i) Fat soluble vitamins-A, D, E, K; (ii) Water soluble vitamins – C, B Complex (thiamine, riboflavin, niacin, B2, B3 and folic acid).
- Cereals, millets and pulses: Composition and nutritive value, types, storage, processing. Cereal cookery. Gluten and factors affecting the gluten formation, cereal starch, gelatinization, dextrinisation. Pulse cookery. Effect of cooking, factors affecting cooking quality, toxic constituents in pulses.
- Milk and milk products: Composition and nutritive value, properties, effect of heat, acid, enzymes, microbes, processed and indigenous milk products and their quality, role in cookery.
- Eggs- nutritive value, storage, evaluation of quality of egg, role of egg in cookery. Vegetables and fruits. Composition and nutritive value, types, storage, selection, post-harvest changes, effect of processing, preservation and cooking on different pigments of both fruits and vegetables. Processed and convenience foods. Ready to eat foods, frozen foods, dehydrated foods, instant food mixes.
- Agricultural development and its effect on food availability. Post harvest processing of foods, concepts and definitions agriculture and food security,
- Malnutrition- Definition and causes, PEM, Marasmus, Kwasiorkor, vicious cycle of malnutrition. Clinical signs and symptoms, nutritional anthropometry, diet survey methods. Major nutritional problems prevalent in India and the state of Protein energy malnutrition, anaemia, vitamin A deficiency, iodine deficiency disorders, obesity, hypertension, atherosclerosis, diabetes mellitus.
- Importance of quality control and assurance. Agmark, Essential Commodity Act, Consumer Protection Act, Bureau of Indian Standards, Codex Standards, fssai. Food additives. Preservatives, coloring agents, antioxidants, emulsifying agents, leavening agents and stabilizing agents

Food safety, risks and hazards Assessment and prevention of food adulteration. Food packaging and packaging material.

- Food Analysis: Proximate analysis- Moisture, ash, crude fat, crude fibre, crude protein and carbohydrates by difference. Principles and methods of food analysis. Basic principles of Refractometry, polarimetry, densitometry, HPLC, GLC, spectrophotometry, electrophoresis, automatic amino acid analyzer.
- Introduction, safe and wholesome water, need for water, use of water), sources of water supply-(rain water, surface water, ground water), water pollution- (Water pollution, natural impurities, manmade water pollution, indicators of pollution, water borne diseases), purification of water(Purification of water in large scale, storage, filtration, supernatant water, sand bed, under drainage system, filter control, disinfection), hardness of water and its treatment, defluoridation of water. Food hygiene: Contamination of foods from various sources. Green plants and fruits, animals, sewage, soil, air and water and their health hazards, Food hygiene, milk hygiene, meat and fish hygiene, hygiene of food handlers, hygiene of eating place.
- Sanitary procedures for preparation, handling and storage of foods.
- Management process- planning - importance, types, characteristics and techniques, organizing; controlling- definition, phases and factors, evaluating- definition and types of evaluating. Time - tools of time management, and process of time management. Decision making process - types, steps in decision making and factors affecting decision making.
- Principles of design and their application to enrich the interiors. Furniture – types of furniture, factors affecting the selection of furniture, care and maintenance of furniture, furniture arrangement, walls, types of floor covering, care, maintenance and selection of floor covering.
- Consumer rights and responsibilities. Consumerism and consumer protection- consumer protection Act and Govt. legislation and order, Sources of consumer information – advertisements, labels, packaging etc.Consumer and environment.
- Work-worker and workplace relationship, work simplification techniques, principles of ergonomics, Household drudgery- Drudgery reduction. Household equipment- introduction, definition, classification of equipments, electrical (refrigerator, toaster, grinder, coffee percolator, geyser, vacuum cleaner, washing machine), and non- electrical (tools,

utensil etc.), factors affecting selection of equipment, use, care and maintenance of household equipment.

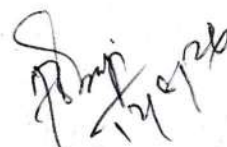
- Concept, need and importance of entrepreneurial development., types of entrepreneurs, functions of entrepreneurs, identification of product / service – starting a project; factors influencing sensing the opportunities. Steps involved in functioning of an enterprise. Selection of the product / services, selection of site, capital sources, acquisition of manufacturing know how, packaging and distribution. Financial management /accounting – funds, fixed capital and working capital, costing and pricing, long term planning and short term planning, book keeping, ledger, subsidiary books, annual financial statement, taxation.
- Issues and scientific concepts associated with conception, pregnancy, prenatal development, labour/ birth, postnatal life: Infancy- physical, motor, social, emotional, cognitive and language characteristics. Antecedent influences for infancy growth and development and early year's growth and development, stimulating approaches for optimizing development.
- Family crises- Definition, when does stress becomes a crisis, hill's ABCX. Theory of family crisis, conditions for crisis, what happens in a crisis, Stages of a crisis, characteristics of crisis events, effects of crises, factors which affect meeting the crises, adjustment to crises, general things to do in times of crises.
- Educational Psychology and Early Childhood Education: Concept of learning- definition, essential features, types of learning, intelligence-reasoning and thinking, temperament, problem solving, information processing; learning environment- reinforcement- definition, types of reinforcements, schedules of reinforcement, importance of reinforcement in learning, motivation- definition, types, modes of motivation (contingency contract, token economy), relationship of motivation with learning and performance.
- Concept, nature, scope, principles and need of family counseling; thrust areas in family counseling- educational, vocational, social, personal, premarital and marital; problems in family counseling, methods of handling problems, approaches to evaluate family counseling, counselor's self-awareness and growth. Situation analysis of child, women, youth, elderly, disabled and reserved category in India and in the world- Census,

issues and challenged, determining factors for the present status, impact of present status on the family and society at large.

- Special needs and special education: Definition of special needs children and special education, terminologies for children with special needs, history of special education, current trends and issues in special education, legislation and litigations of special education, labeling- definition and its effects. Mainstreaming- definition, models of mainstreaming, problems in implementing mainstreaming, effect of mainstreaming on children with special needs.. Intervention- concept, methods, steps and process, intervention strategies for children with special needs, role of professionals, need and importance of family centered intervention.
- Trends and challenge in developmental assessment of young children, Tools & techniques of assessment. Interpretation of assessment information for parents, educators & policy makers. Identification of children with developmental challenges. Ethical issues in assessment of children.
- Importance and function of clothes Socio- economic and psychological factors affecting clothing choices, Clothing requirements of different age groups: infant, toddler, pre-school children, school age children, teenager, adolescent, adult and senior citizen Application of elements and principles of art in apparel designing
- Dyeing techniques fibre dyeing, yarn dyeing and piece dyeing Styles of printing: Direct, discharge and resist printing Basic printing methods: Block, screen, tie and dye and batik
- Community: Meaning and definition, types of communities, community and science, community mobilisation- leadership, participation-PRA. Community development programmes- concept, objectives, organization, activities, achievement and failures. Rural development- concept, need, meaning, aim and functions of extension education for rural development. Current rural development programmes/ Organisations- SGSY, MGNREGA, IAY, ICDS, Total sanitation schemes/ campaigns etc., DWMA, ATMA, ITDA, DRDA, KGMV. Role of ICAR, SAUs, KVKs, DAATTCs and NGOs in rural development.
- Role of women in agricultural and allied sectors, status of farm women - Social, economic and health status of women in agriculture, Women friendly tools and implements, Gender issues, Women in agriculture

Policy, Programmes (government and non-government)and institutions for women in agriculture, Women empowerment in agriculture, Agripreneurship and training to farmwomen.

- Concept, definition, objectives, principles relevant terms used in programme planning: situation, aims, objectives, problem, solution, project, plan, plan of work, calendar of work etc. Steps in extension programme planning: elaborate discussion. Leader and leadership: meaning, definition, identification of leader execution of programme: Role of local leader, involvement of local leaders, involvement of local bodies, organizations and extension agencies. Implementation of programme and constraints associated with it. Monitoring and evaluation: concept, meaning, definition.
- Types of Training.training process, different phases of training and its management. Qualities of a good trainer- communications skills, training skills, motivational skills and handling difficult situations. Adult learning, characteristics of adult learner. Facilitation skills in training, problem and prospects of training. Designing training module: Basic guidelines, steps in module designing. Training methods. Training evaluation: Objectives, principle, steps and indicators of training evaluation. Important training institutions in India
- Concept and elements of diffusion process. Innovation–decision process, types of innovation–decision, consequences of innovations. Adoption: meaning, definition, adoption process, factor affecting adoption and innovation – decision process and constraints.
- Different terms used in diffusion of innovation and adoption process: Rate of adoption, over adoption, innovativeness, dissonance, rejection, discontinuance. Adopter categories: concept and types.
- Homestead technology: Different channels of communication and their characteristics. Social change: concept, theories, dimensions and factors. Change agents and opinion leader; change proneness – acceptance and resistance to social change. Different homestead technologies with special reference to Home Science.



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OUAT, Bhubaneswar

B. TECH. (AGRICULTURAL ENGINEERING)

- Nature and origin of soil; important soil physical properties, soil inorganic colloids – their composition, properties and origin of charge; ion exchange in soil and nutrient availability; soil organic matter – its composition and decomposition, effect on soil fertility; soil reaction – acidic, saline and sodic soils; quality of irrigation water; essential plant nutrients – their functions and deficiency symptoms in plants; important inorganic fertilizers and their reactions in soils. Use of saline and sodic water for crop production, Gypsum requirement for reclamation of sodic soils and neutralizing RSC; Liquid fertilizers and their solubility and compatibility.
- Precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Hydrologic processes- interception, infiltration -factors influencing, measurement and indices. Evaporation - estimation and measurement. Runoff - factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, rational method, Cook's method and SCS curve number method. Open Channel Hydraulics, Hydraulic jump and its application.
- Flood routing – channel and reservoir routing. Drought – classification, causes and impacts, drought management strategy.
- Purpose of irrigation, source of irrigation water, present status of development and utilization of different water resources of the country; measurement of irrigation water: weir, flumes and orifices and other methods; design and lining of irrigation field channels, on farm structures for water conveyance, control & distribution; underground pipe conveyance system: components and design; land grading and design criteria for land levelling, soil water plant relationship: soil properties influencing irrigation management, soil water movement, soil water potential, measurement of soil moisture, moisture stress and plant response; water requirement of crops: concept of evapotranspiration (ET), measurement and estimation of ET, water and irrigation requirement of crops, depth and frequency of irrigation, irrigation efficiencies; surface methods of water application: border, check basin and furrow irrigation. Drainage of Agricultural land.

- Sprinkler irrigation: types of sprinkler irrigation systems; design of sprinkler irrigation system: layout selection, performance evaluation of sprinkler irrigation system, Micro Irrigation Systems: types, design of drip irrigation system: general considerations, wetting patterns, irrigation requirement, emitter selection, hydraulics of drip irrigation system, design steps; maintenance of micro irrigation system
- Soil erosion – types, factors affecting and effects of erosion. Water erosion: Mechanics and forms, Wind erosion: Factors affecting, mechanics, Gullies: Classification, stages of development. Soil loss estimation – Universal soil loss equation (USLE) and modified USLE. Soil erosion control structures - introduction, classification and functional requirements. Permanent structures for soil conservation and gully control - check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures, Measurement of soil erosion, Water erosion control measures: Agronomical measures and Engineering measures. Design and layout of Bunds and terraces, Gully and ravine reclamation, Land capability classification. Sedimentation quantification and management
- Watershed development: Topographical survey, Watershed management-concept, objectives, watershed codification, delineation and prioritization of watersheds. Participatory watershed management role of watershed associations, user groups and self-help groups. Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.
- Water harvesting techniques - classification based on source, storage and use. Runoff harvesting –purpose and design criteria. Components, site selection, and design criteria of farm ponds, dug-out and embankment reservoir types, tanks, nala bunds, and subsurface dykes.
- Occurrence and movement of ground water; Aquifer and its types; classification of wells, fully penetrating tube wells and open wells, familiarization of various types of bore wells; design of open wells; Darcy's law, determination of hydraulic conductivity laboratory and field method, groundwater hydraulics- Dupit's assumptions and Dupit's method, Thiem's method, determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method; well interference, groundwater exploration techniques; methods

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of drilling of wells: percussion, rotary, reverse rotary; DTH, design of tubewell and gravel pack, development of tube well; basin wise ground water development, safe yield, factors governing safe yield, conjunctive use of ground water, quality of ground water; artificial groundwater recharge techniques; water lifting devices; classification of pumps, components of centrifugal pumps, priming, pump selection, installation and trouble shooting, performance curves, effect of speed on capacity, head and power, effect of change of impeller dimensions on performance characteristics; hydraulic ram, deep well turbine pump and submersible pump.

- Precision agriculture – need and functional requirements. Familiarization with issues relating to natural resources. Familiarization with equipment for precision agriculture. Introduction to GIS based precision agriculture and its applications. Introduction to sensors and application of sensors for data generation. Database management system concept.
- Floods - causes of occurrence, flood classification - probable maximum flood, standard project flood, design flood, flood estimation - methods of estimation; estimation of flood peak - rational method, empirical methods, unit hydrograph method. Statistics in hydrology, flood frequency methods - log normal, Gumbel's extreme value, log-Pearson type-III distribution; depth-area-duration analysis. Flood forecasting. Flood routing - channel routing, Muskingum method, reservoir routing, modified Pul's method. Flood control - history of flood control, structural and non-structural measures of flood control, storage and detention reservoirs, levees, channel improvement. Seepage through dams, flow net and its properties, seepage pressure, seepage line in composite earth embankments, drainage filters, piping and its causes. Design and construction of earthen dam, stability of earthen embankments against failure by tension, overturning, sliding etc., stability of slopes - analysis of failure by different methods.
- Engineering properties of agricultural produce, Physical, thermal, aerodynamic and frictional properties, Cleaning and grading, types of cleaners, separators and graders, Moisture content and its determination, Equilibrium moisture content, Drying principles and theory, Different methods of drying, grain dryers, Thin layer and deep bed drying, Constant and falling rate drying period, Dryer performance,

Psychrometry, Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins, Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds.

- Methods of parboiling of rice, pressure parboiling method, Size reduction, Size reduction Laws, principles of size reduction and equipments, Rice milling operations, types of rice milling (traditional and modern rice milling), different unit operations and equipment; Milling of wheat: Unit operations and equipment; Milling of pulses: Traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods, CFTRI and Pantnagar methods of pulse milling, pulse milling machines; Milling of corn and its products: Dry and wet milling; Milling of oilseeds: Mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran; Extrusion cooking: Principle, factors affecting extrusion cooking, single and twin screw extruders; By-products utilization; Mixing and types of mixers, Material handling equipment: Types of conveyors (belt, roller, chain and screw), elevators (bucket, cranes & hoists), trucks (refrigerated/ unrefrigerated), pneumatic conveying.
- Characteristics and properties of horticultural crops important for processing; Preservation Technology: General methods of preservation of fruits and vegetables, Brief description and advantages and disadvantages of different physical/ chemical and other methods of preservation, Flowcharts for preparation of different finished products, Food supply chain; Sorting and grading equipments; Peeling: Different peeling methods and devices, Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc.; Thermal processing of food, Canning, Blanching: Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture); Dryers for fruits and vegetables, osmo-dehydration, freeze drying
- Engineering, thermal and chemical properties of milk, Unit operation in dairy processing plant, Homogenisation, cream separation, Pasteurization,

sterilization, Evaporation, drying of liquid food, spray drying, drum drying,

- Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations, Preparation of simple joints: Cross half Lap joint and T-Halving joint; Preparation of Dovetail joint, Mortise and tenon joint; Jobs on Bending, shaping etc.; Jobs on Drawing, Punching, Rivetting. Introduction to tools and measuring instruments for fitting; Jobs on sawing, filing and right angle fitting of MS Flat; Practical in more complex fitting job; Operations of drilling, reaming, and threading with tap and dies; Introduction to tools and operations in sheet metal work; Making different types of sheet metal joints using G.I. sheets. Introduction to welding equipment, processes tools, their use and precautions; Jobs on ARC welding – Lap joint, butt joint; T-Joint and corner joint in Arc welding; Gas welding Practice – Lab, butt and T-Joints.
- Electrical circuits and power systems used in agricultural operations. Topics include DC and AC circuits, Ohm's law, Kirchhoff's laws, network theorems, single-phase and three-phase systems, transformers, power factor improvement, electrical measurements, and energy consumption calculations. Applications in agricultural pump sets and farm electrification.
- The construction, working principles, characteristics, testing, and applications of DC motors, induction motors, synchronous motors, single-phase motors, alternators, generators, and transformers. Motor starting methods, speed control, efficiency improvement, and maintenance practices are also included. Agricultural applications include irrigation pumps, grain handling equipment, dairy machinery, and processing units.
- Agricultural Electrification covers electrical installations in farms. Topics include farm wiring, earthing systems, electrical safety, distribution systems, lighting, pump installations, motor protection, load estimation, tariff structures, energy auditing, rural electrification, and electrical standards. Knowledge of safe electrical practices in agricultural environments.
- Transducers, pressure sensors, temperature sensors, humidity sensors, moisture sensors, load cells, flow meters, level sensors, strain gauges,

data acquisition systems, signal conditioning, calibration techniques, and instrumentation used in precision agriculture and automated irrigation systems.

- Topics include electric pumps, motor protection devices, variable frequency drives (VFDs), electric tractors, battery-operated farm equipment, efficient motor selection, energy conservation techniques, farm energy auditing, demand-side management, and energy-efficient agricultural practices.
- Basic introduction to computer, computer architecture, operating systems, input-output devices, memory systems, storage devices, file management, computer networking, internet technologies, cybersecurity basics, cloud computing, MS Office applications, and digital documentation. Knowledge of spreadsheets and data analysis for farm management. Parts of computer, basic knowledge in MS office.
- Surveying: Introduction, classification and basic principles, linear measurements. Chain surveying. Cross staff survey, compass survey. Planimeter, errors in measurements, their elimination and correction. Plane table surveying.
- Levelling: Levelling, leveling difficulties and error in leveling, contouring, computation of area and volume. Theodolite traversing. Introduction to setting of curves. Total station, electronic theodolite. Introduction to GPS survey.
- Building materials: Rocks, stones, bricks properties and varieties of tiles, lime, cement, concrete, sand. Glass, rubber, plastics, iron, steel, aluminium, copper, nickel. Timber.
- Building components: Lintels, arches, stair cases, different types of floors, finishing: damp proofing and water proofing, plastering, pointing, white washing and distempering – painting, building design, design procedures, technology, building construction, types of agricultural buildings and related needs, application of design theory and practice to the conservation, sloped and flat roof buildings,
- Construction economics: Preliminary estimates, detailed estimates of buildings source of cost information, use of cost analyses for controlling design, factors affecting building costs; cost evaluation of design and planning alternatives for building and estate development, measurement and pricing, economic methods for evaluating investments

- in buildings and building systems: cost-in-use, benefit-to-costs and savings-to-investment ratios, rate of return, net benefits, payback
- Farmstead: Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods
 - Animal Housing and farm structures: Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures. Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc. Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds.
 - Protected cultivation: Introduction, history, origin, development, national and international scenario, components of green house, perspective, types of green houses, polyhouses /shed nets, cladding materials, plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment, design and construction of greenhouses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment, greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc. Greenhouse heating – necessity, components, methods, design of heating system. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation. Irrigation in greenhouse and net house – water quality, types of irrigation system, components, design, installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material

requirement. Maintenance of irrigation and fogging systems. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application. Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post-harvest techniques; economic analysis.

- Identification and selection of machines for various operations on the farm. Hitching systems and controls of farm machinery. Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines. Introduction to seed-bed preparation and its classification.
- Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows, puddler, cultivators, identification of major functional components.
- Introduction to sowing, planting & transplanting equipment. Introduction to seed drills, no-till drills, and strip-till drills.
- Introduction to planters, bed-planters and other planting equipment like sugarcane, potato. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation. Introduction to materials used in construction of farm machines.
- Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines.
- Additives in the coolant. Study of radiator efficiency. Study of ignition system of SI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing
- Concept and limitation of renewable energy sources (RES), criteria for assessing the potential of res, classification of RES: solar, wind, geothermal, biomass, ocean energy sources, comparison of renewable

- energy sources with non-renewable sources. Solar energy: energy available from sun, solar radiation data, solar energy conversion into heat through flat plate and concentrating collectors, different solar thermal devices, principle of natural and forced convection solar drying system,
- Wind energy: energy available from wind, general formula, lift and drag. Basics of wind energy conversion,
 - Bio-energy: properties of biomass and conversion technologies, pyrolysis of biomass to produce solid, liquid and gaseous fuels. Biomass gasification, types of gasifier, various types of biomass cook stoves for rural energy needs. Biogas: basics of anaerobic digestion, types and constructional details of biogas plants, biogas generation and its properties, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.
 - Biogas technology and mechanisms, generation of power from biogas, Design & use of different commercial sized biogas plant. Power generation from urban, municipal and industrial waste. Power generation from biomass (gasification & Dendro thermal), Mini and micro hydel plants. Animal power based technology.
 - Familiarization with different makes and models of agricultural tractors. Driving practice of tractor. Practice of operating a tillage tool (mould-board plough/ disc plough) and their adjustment in the field. Study of field patterns while operating a tillage implement. Hitching & De-hitching of mounted and trail type implement to the tractor. Driving practice with a trail type trolley – forward and in reverse direction. Introduction to tractor maintenance – precautionary and break-down maintenance.
 - Tractor starting with low battery charge. Introduction to trouble shooting in tractors. Familiarization with tools for general and special maintenance.
 - Repair and maintenance of implements – adjustment of functional parameters in tillage implements. Replacement of broken components in tillage implements. Replacement of furrow openers and change of blades of rotavators. Maintenance of cutter bar in a reaper. Adjustments in a thresher for different crops. Replacement of V-belts on implements. Setting of agricultural machinery workshop.
 - Introduction to mechanics of tillage tools, engineering properties of soil, principles and concepts, stress strain relationship, design of tillage tools

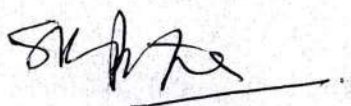
principles of soil cutting, design equation, force analysis, application of dimensional analysis in soil dynamics and traction prediction equation. Introduction to traction and mechanics, off road traction and mobility, traction model, traction improvement, tyres-functions, size, lug geometry and their effects, tyre selection and testing, soil compaction and plant growth, variability and application of GIS in soil dynamics.

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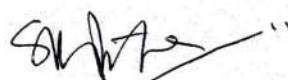
BACHELOR OF FISHERY SCIENCE

- Aquaculture vs Agriculture. Systems of aquaculture - pond culture, pen culture, cage culture, running water culture and zero water exchange system,. Extensive, semi-intensive, intensive and super intensive aquaculture in different types of water bodies viz., freshwater, brackish water inland saline and marine water.
- Principles of organic aquaculture. Pre-stocking and post stocking pond management. Carrying capacity of pond, factors influencing carrying capacity.
- Major candidate species for aquaculture: freshwater, brackish-water and marine. Monoculture, polyculture and integrated culture systems. Water and soil quality in relation to fish production. Physical, chemical and biological factors affecting productivity of ponds.
- Major species cultured, Nursery, rearing and grow-out ponds preparation and management-control of aquatic weeds and algal blooms, predatory and weed fishes, liming, fertilization/manuring, use of biofertilizers, supplementary feeding. Water quality management.
- Selection, transportation and acclimatization of seed. culture methods- Indian major carps, exotic carps, air breathing fishes, cold water fishes, freshwater prawns, mussels. Composite fish culture system of Indian and exotic carps-competition and compatibility. Exotic fish species introduced to India. Culture of other freshwater species. Medium and minor carps, catfish and murels. Species of fish suitable for integrated aquaculture.
- Integration of aquaculture with agriculture/horticulture. Integration of aquaculture with livestock. Cultivation of aquatic macrophytes with aquaculture (makahana). Paddy cum Fish/Shrimp Culture.
- Candidate species of phytoplankton and zoo-plankton as live food organisms of freshwater and marine species.
- Different varieties of exotic and indigenous ornamental fishes. Principles of a balanced aquarium. Fabrication, setting up and maintenance of freshwater and marine aquarium. Water quality management. Water filtration system-biological, mechanical and chemical. Types of filters. Aquarium plants and their propagation methods. Lighting and aeration.
- Aquarium accessories and decorative. Aquarium fish feeds. Breeding and rearing of ornamental fishes. Broodstock management. Management practices of ornamental fish farms. Common diseases and their control. Conditioning, packing, transport and quarantine methods.
- Principal nutrients and nutritional requirements of cultivable fish and shellfish. Methods of feed formulation and manufacturing. Forms of feeds: wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets. Feed additives: binders, antioxidants, enzymes,



pigments, growth promoters, feed stimulants. Feed storage: use of preservatives and antioxidants. Non-conventional feed ingredients and antinutritional factors. Digestive enzymes, feed digestibility. Factors affecting digestibility. Nutritional deficiency diseases.

- Natural seed resources, site selection and collection methods. Life cycle of important shellfish (*Penaeus monodon*, *P. indicus*, *Macrobrachium rosenbergii*, *P. Vannamei*, *Scylla serrata*, lobster, edible, oyster, pearl oyster, fresh water mussel, holothurians, horse-shoe crab, Sepia, Loligo, cray fish etc.). Sexual maturity and breeding seasons of different species. Food and feeding of larval stages of important shellfishes. Health management in hatcheries.
- Fishing crafts and gears. Major riverine and estuarine systems of India. Major brackish water lakes and their fisheries. Fisheries of major reservoirs / natural lakes of India. Flood-plain capture fishery- present status of their exploitation and future prospects. Cold water fisheries of India.
- Study of external and internal organization of commercially important crustaceans and molluscs. Digestive, respiratory, circulatory, nervous and reproductive systems. Food and feeding habits, growth, moulting, length – weight relationship. Reproductive biology, larval stages. Age and growth determination by direct and indirect methods.
- Aquatic Microbiology: Introduction and scope of aquatic microbiology, aquatic environment as habitat for microorganisms - bacteria, cyanobacteria, fungi, algae, parasites and viruses; distribution of microorganisms and their biomass in rivers, lakes, sea and sediment.
- Stress in aquaculture and its role in disease development. Role of physical (injuries, health, cold) chemical (pH, salinity, toxins, ammonia, nitrogenous waste, endogenous chemicals and metabolites, free radicals, oxidants) soil and water parameters in fish health. Nutritional diseases . Non-infectious diseases.
- Principles of disease diagnosis, conventional, molecular and antibody based diagnostic methods, Rapid diagnostic methods.
- Types of poisoning- Toxicity testing - Chronotoxicity factor, Untoward effects, Common causes, Diagnosis of poisoning, Factors modifying toxicity, Toxicokinetics, Toxicodynamics, General approaches to diagnosis and treatment of poisoning.
- Toxicity caused by metal and non-metals, Phytotoxins- Toxic principles of various alkaloids and toxic plants, Drug toxicity and toxicity caused by agrochemicals.
- Temperature: Temperature instruments; effects of vertical air motion on temperature. Humidity and water vapour: relationship between temperature and humidity; distribution of water vapour in atmosphere; evaporation, humidity instruments and measurements. Condensation and precipitation: process of conditions of condensation, forms of condensation; precipitation; forms of precipitation, measurement of



precipitation. classification of clouds; conditions of cloud formation; reporting and identification of clouds; thunderstorms. Atmospheric pressure: the laws of Gases; pressure units; pressure instruments. Wind: characteristics of wind motion; wind observation and measurement; wind representation; factors affecting wind motion.

- Terrestrial or planetary winds: ideal planetary wind system; planetary pressure belts. Planetary wind system; secondary winds; monsoon winds; land and sea breeze.
- Tropical cyclones: storm divisions; pressure and winds; vertical structure of storm centre; hurricane, sea, swell and surge; hurricane warning. Weather forecasting: forecasting process; forecasting from local indications; role of satellite in weather forecasting; synoptic weather charts. Effects of climate change on fisheries sector.
- Composition of waters: surface water, ground water and sea water. Dissolved gasses: Factors affecting natural waters. Acid, base, salts: Hydrogen ions, modern concept of pH and buffer. Water analysis: collection and preservation of water samples.
- Measurement of temperature. transparency, turbidity, determination of pH, electrical conductivity, salinity, chlorinity, total solids (TDS, TSS, TVS, TVDS), dissolved oxygen, free carbon dioxide, total alkalinity, total hardness, Calcium, Magnesium, Inorganic Nitrogen (Ammonium and Nitrate) and phosphorus. Water quality criteria/ requirements for Aquaculture.
- Introduction to limnology: inland water types, their characteristics and distribution; ponds and lakes; streams and rivers; dynamics of lentic and lotic environments. Plankton: planktonic organisms; classification of plankton; distribution of plankton: geographic, vertical, horizontal and seasonal distribution of phytoplankton and zooplankton; seasonal changes of body form in planktonic organisms; food of planktonic organisms; primary productivity:
- Aquatic plants: characteristics, classification, zonation, seasonal variations, quantity produced chemical composition distribution in different waters, limnological role.
- Nekton: composition, distribution, movements. Benthos: classification; periphyton; zonation; distribution; movements and migration; seasonal changes in benthos, profundal bottom fauna. Biological productivity: circulation of food material; classification of lakes based on productivity.
- Components of aquatic systems, nutrient cycles, energy flow, food chain. prey-predator relationship, host parasite relationship. Aquatic biodiversity-its importance, species diversity, genetic diversity, habitat diversity, diversity indices.

- Types of natural and manmade hazards in fisheries and aquaculture - cyclones, floods, droughts, tsunami, El-nino, algal blooms, avalanches, pollution, habitat destruction, over fishing, introduction of exotic species, landslides, epidemics, loss of bio-diversity etc. Causes, characteristics and effects of disasters. Management strategies: pre-disaster, during disaster and post-disaster
- Introduction to aquatic pollution, the sources of pollutants, toxic organic compounds and their impacts in the aquatic organisms and the abiotic environment, Adverse effects of oxygen demanding wastes: importance of dissolved oxygen; Oxygen demand; BOD; COD; Pesticide types and categories; inorganic pesticides, Organo-chlorine compounds, Organo-phosphorous compounds; Polychlorinated biphenyls (PCBs); Bioaccumulation and impact on aquatic fauna and human health; toxicology. Heavy metals: Interaction of heavy metals with water and aquatic organisms. Bioremediation and Phytoremediation. Oil pollution
- Introduction to freezing technology; characteristics of fish and shellfish; changes in fish after death, spoilage of fish, spoilage and pathogenic microorganism. Handling of fresh fish; sanitation in processing plants. Principles of low temperature preservations. Chilling of fish – methods and equipment for chilling; icing – quality of ice, ice making; refrigerated or chilled sea water, chilling rate; spoilage of fish during chilled storage; use of antibiotics and chemicals.
- Canning process, process flow steps involved HTST and aseptic canning. General steps in canning procedure and importance, preparation of raw material, packing, pre-cooking, exhausting, seaming, retorting, cooling labelling and storage.
- Packaging equipment and machinery. Package design, evaluation and testing.
- Composition of fish with emphasis on nutritional value. Concept of Biological value, Protein Efficiency ratio, Net protein utilization. Amino acids of fish and shellfishes and importance of essential amino acids. Fish lipids: fatty acids, nutritional quality. Role of fish lipids in human nutrition.
- Principle of fish preservation and processing. Processing of fish by traditional methods – salting, sundrying, smoking, marinating and fermentation.
- Selection of site for aqua farm- site selection criteria, pre-investment survey viz., accessibility, physical features of the ground, detailed survey viz., site condition, topography, soil characteristics. Land Surveying- definition, principles of surveying, classification of surveying, instruments used for chaining, chaining on uneven or sloping ground and error due to the incorrect chain length.

- Calculation of area of regular and irregular plane surfaces, Trapezoidal and Simpson's rule, volume of regular and irregular shape as applied to stacks and heaps, calculation of volume of pond. Earth work calculations- excavation, embankment, longitudinal slope and cross slope, calculation of volume of earth work as applied to roads and channels.
- Water distribution system- canal, types of canals; feeder canal, diversion canal Layout plan and design of hatcheries- brood stock ponds, artemia hatching tanks, sheds etc, Raceway culture system- site selection, layout plan, types of raceway culture system viz., parallel system, series system etc., Aerators- principles, classification of aerators and placement aerators. Pumps- purpose of pumping, types, selection of pump, total head, horse power calculation. Filters- types and constructions.
- Fishing accessories – thimbles, shackles, C-links, rings, G-links, Kelly's eye, stopper, bottle screw, Deck layout of different fishing vessels. Trawling: Beam trawling; otter trawling; side trawling; twin trawling out rig trawling bull trawling and mid water trawling.
- Line fishing: Types of hooks; structure and size of hooks. Constructional details of long line, tuna long line, vertical long line, pole & line and trolling line.
- Types of refrigeration systems i.e., Air refrigeration, vapour absorption refrigeration system. Vapour compression refrigeration system. Design and construction of freezers i.e. Plate freezer, Blast freezer, Tunnel freezer, spray or immersion freezers, refrigerated fish rooms and fish hold. Alternative refrigeration technique arrangements used onboard the fishing vessel i.e., Refrigerated sea water (RSW), Chilled sea water (CSW). Refrigerated transport. Cooling load: Unit of refrigeration,
- Definition of statistics, Concepts of population, sample, Census and sample surveys, Classification of data, frequency and cumulative frequency table. Diagrammatic and graphical representation of data - bar diagrams, pie-diagram, histogram, frequency polygon, frequency curve and Ogives. Important measures of central tendency - arithmetic mean median and mode. Relative merits and demerits of these measures. Important measures of dispersion, Range, Mean Deviation, Variance and Standard Deviation. Relative merits and demerits of these measures. Coefficient of variation; Normal Curve, Concepts of Skewness and kurtosis.
- Definitions of probability, mutually exclusive and independent events, conditional probability, addition and multiplication theorems. Random variable, concepts of theoretical distribution; Binomial, Poisson and Normal distributions and their use in fisheries. Basic concept of sampling distribution; standard error and central limit theorem. Introduction to statistical inference, general principles of testing of hypothesis, types of errors. Tests of significance based on Normal, t, and Chi-square distributions. Bivariate data, scatter diagram, simple linear correlation,

measure and properties, linear regression, equation and fitting; relation between correlation and regression, Length weight relationship in fishes; applications of linear regression in fisheries. Methodology for estimation of marine fish landings in India, Estimation of inland fish production in India and problems encountered.

- Introduction to MS Office - Word, Excel, Power Point. Audio visual aids - definition, advantages, classification and choice of A.V aids; cone of experience and criteria for selection and evaluation of A.V aids; video conferencing. Communication process, Berlo' s model, feedback and barriers to communication
- Fisheries extension methods- individual, group and mass contact methods and their effectiveness, factors influencing their selection and use; characteristics of technology, transfer of technology process; important TOT programs in fisheries; Adoption and diffusion of innovations, adoption and diffusion process, adopter categories and barriers in diffusion of fisheries innovations;
- Extension program planning and evaluation - steps and importance; participatory planning process. Basic concepts in rural sociology and psychology and their relevance in fisheries extension; social change, social control, social problems and conflicts in fisheries; gender issues in fisheries; theories of learning, learning experience, learning situation
- Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; Generation, incubation and commercialization of ideas and innovations.
- Introduction to fish business management- Concept of management, management process (planning, organising, staffing, leading and controlling), Organizational behaviour, human resource planning, new dimensions in fish business environment and policies. Accounting procedures of fish business entity. Emerging trends in fish production, processing, marketing and exports.

Signature

11/08/2026
for Dean

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