A. Programme Mission and Objective

The discipline “TISSUE CULTURE” a novel concept of culturing totipotent single cells and developing the plants that is challengeable to the environmental habitat including to the dominating pathogens that cause diseases. Gottlieb Haberlandt, the father of plant tissue culture, established this unique process that involves the cultivation of embryo and culturing of vegetative cells in vitro and acclimatizing in vivo. Tissue culture has at most priority in the fields of Plant Breeding, Plant Propagation and Plant Biotechnology. It has become one of the most reliable and dependent technology among the plant science study. Inclusive of Molecular Biology and Genetic Engineering, this branch of science can revolutionize the existing system. This branch has been exploited and explored in different contexts viz., Industrial, Commercial production of saplings including in the field of Research and development etc.,

On the other hand, cell culture technique enables to understand the structure and functions of cells which is programmed by Genetic Engineering tools and techniques for the production of vaccines, interferon, clinical substances viz., growth hormones, monoclonal antibody production, stem cells etc., However, this field is another candidate in the pool of scientific horizon that creates ample avenues for undergraduate and postgraduate students in both the field of research and placements in research and developments and also in biotechnology based companies. The students will be technically and critically trained with good practical exposure to perform both the plant and animal culture, which is the at most required in this field of science.

This branch of science has been exploited in a wide array of areas viz., horticulture, forestry in particular and plant sciences in general. The discipline is extrapolated to conserve endangered plant species, herbicide resistant varieties, for the production of plant derived secondary metabolites, recombinant proteins which has wide applications in biopharmaceuticals, and in the growth of tissues or cells used in health and medical research and treatments etc., For the regeneration of novel hybrid through the protoplast fusion technology, development of stress resistant varieties, embryo rescue the most happening area, induction of polyploidy-yield based regeneration of disease free plants, regeneration of transgenic plants with high vigor against the environmental stress and high yielding capability, are the thirst areas of exploration.

Agricultural literates of tissue culture have set up their own laboratories for the propagation of the plants which is the need in the society; there exists some independent laboratories that provide custom propagation services too. The lists of commercial tissue culture labs can be availed from Plant tissue culture information exchange. As this area is purely skill based and labour intensive, it is important to determine the plants in need at
the commercial scale and in demand that can be maintained in viable state to be propagated in the laboratory.

Post Graduate Diploma in Tissue Culture is the skill based and society need based course offered only in the Jagadguru Sri Shivarathreeshwara University, which has wide applications in various fields of science. In the forthcoming years the diploma course will be expanded to the M. Sc course, which sounds to be the first of its kind in the region.

(a) Rationale : The main reason for offering this programme are

- The discipline “TISSUE CULTURE” a novel concept of culturing totipotent single cells and developing the plants that is challengeable to the environmental habitat including to the dominating pathogens that cause diseases. Gottlieb Haberlandt, the father of plant tissue culture, established this unique process that involves the cultivation of embryo and culturing of vegetative cells in vitro and acclimatizing in vivo. Tissue culture has at most priority in the fields of Plant Breeding, Plant Propagation and Plant Biotechnology. It has become one of the most reliable and dependent technology among the plant science study. Inclusive of Molecular Biology and Genetic Engineering this branch of science can revolutionize the existing system. This branch has been exploited and explored in different contexts viz., Industrial, Commercial production of saplings and Research and development etc.,

- On the other hand, cell culture technique enables to understand the structure and functions of cells which is programmed by Genetic Engineering tools and techniques for the production of vaccines, interferon, clinical substances viz., growth hormones, monoclonal antibody production, stem cells etc.,

- In the current scenario tissue cultured plantlets are on demand in the country. It is estimated that around 200 crores of turnover in the domestic market is proving its potency with 20% annual growth. There are more than 70 commercial tissue culture units established in the country. This field of science is also supported by Department of Biotechnology (DBT) in various research institutions and Universities for improving the protocols that can be extrapolated to the different fields viz., State Agriculture Department, Agri Export Zones (AEZs), Spice Board, Sugar industry, Paper industry, Medicinal plant industry and State Forest Departments etc.,

(b) Goals and objectives

- This field is another candidate in the pool of scientific horizon that creates ample avenues for undergraduate and postgraduate students in both the field of research and placements in research and developments and also in biotechnology based companies.
- The students will be technically and critically trained with good practical exposure to perform both the plant and animal culture, which is the at most required in this field of
science, skilled candidates are absorbed in well established and commercial tissue culture units.

- This area can be taken up as micropropagation business with smaller investment by entrepreneurs.
- Many Central and State Government departments to name a few: The Department of Agriculture and Cooperation, National Horticulture Board (NHB) under the Ministry of Agriculture, Agricultural and Processed food products Export Development Authority (APEDA) under the Ministry of Commerce and Industry etc., are promoting by providing various schemes and subsidies along with incentives to strengthen this stupendous discipline.

B. Relevance of the programme with HEI’s Mission and Goals

- Unique of its kind offered only in JSS University
- Candidates can pursue PG Diploma in Tissue Culture concurrently with masters degree as Add-on course
- Hands on training at Bharathiar University, Coimbatore as of MOU
- Program curriculum design aids for entrepreneurship
- Openings at various tissue culture firms and agricultural sectors

C. Nature of prospective target group of learners

Basic Science graduates may not have the opportunities to pursue the higher education in the respective fields. short term course with basic knowledge to be an entrepreneurs is the idea of priority in the current context. There exists the scope in this field that fetches the livelihood with better knowledge of agriculture and economical crops handling and management.

- Life Science Graduates
- Students with constraints for full time programme
- Working professionals seeking professional/personal growth.
- Government officials
- Home makers
- Physically challenged candidates who cannot attend the regular mode of education.
- Aspiring students with lower disposable income
D. Appropriateness of programme to be conducted in open and distance learning mode to acquire specific skills and competence

- The contents can be delivered and learned by students through SLM (Self Learning Material).
- The video lectures can be uploaded in the University website.
- The programme will help as a launch pad for higher level competency both in state and National spheres.

E. Instructional Delivery Mechanism

JSS University follows a modern ICT enabled approach for instruction. The methodology of instruction in JSS University is different from that of the conventional /regular programs. Our system is learner-oriented and the learner is an active participant in the teaching-learning process. Most of the instructions are imparted through online and distance mode. Academic delivery systems of JSS University are:

- **Print Material**: JSS University mainly focuses on Self Learning Material (SLM) and their up gradation by eminent teachers/academicians both from JSS University and other reputed universities/institutions. As text information plays a vital role in distance education, print based instruction has a critical role in JSS University distance learning initiatives.
- **Audio-Visual Material Aids**: The learning package contains audio and video programmes which have been produced by the University for the enhancement of understanding of the course material given to the student. The video lectures are uploaded in the University website for the student’s access.
- **Online/Virtual Classes**: Delivery of classroom-like lectures will also be available in the student portal for enhanced learning experience.
- **Laboratory facilities**: JSS University has advanced laboratory for practical training for younger minds to get hands on experience in cutting edge techniques.

I) Identification of Media

Print, Audio-Video and Online media will be utilized for the dissemination of knowledge relevant to the program enrolled.

II) Student support system

JSS University provides an exclusive online portal for students to cater to all of their academic related matters such as notification of contact classes, assignment details, course material, and examination schedule. In addition, each student has provision to seek guidance, counseling and career guidance throughout the program.

F. Procedure for admissions, curriculum transaction and evaluation
Admission to all the programs is through notification in newspaper and on University website. The admission procedure involves submission of filled application by the candidates after paying the prescribed fees. The admission scrutiny committee evaluates all the submitted applications and recommend the eligible candidates. The selected candidates are notified through admissions office and also on the University website. The selected candidates are expected to report within the stipulated timeframe for provisional admission to the program.

Curriculum transaction for the program is through the designated online student portal as detailed above in Section E.

Evaluation: Evaluation will be done as follows:

- University end semester examination: 75 marks for each subject
- Internal Assessment: 25 marks for each subject (theory test, seminars, assignments)
- Independent Project work (for PG and PGD programs): 350 marks
- Project Viva Voce (for PG and PGD programs): 150 marks

### Basic Structure and Distribution of Courses

<table>
<thead>
<tr>
<th>Part</th>
<th>Study Component</th>
<th>Papers x credit</th>
<th>CIA Marks</th>
<th>University Examinations</th>
<th>Total Marks</th>
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<td>Core Paper (I,II,III &amp; IV)</td>
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<td><strong>1000</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

**G. Requirement of the Laboratory support and the library resources**

The University has designated laboratory space to meet the curriculum requirements of all the programs.

Library resources: For the enhanced learning opportunities of each of the students enrolled under the open and distance learning mode, JSS University has mobilized the required textbooks, journals and articles for access in the department library. These materials are in addition to the printed study material available for each student.

**H. Cost estimate of programme and provisions**
Cost estimate of each student/year is as follows:

Certificate Program – Distance Mode = Rs. 10,000

UG Program – Distance Mode = ranges from Rs. 15,000 – Rs. 20,000

PG and PGD Program – Distance Mode= ranges from Rs. 15,000 – Rs. 75,000

The provisions include the following: study material both print and online materials, hiring faculty members for contact program, contact program laboratory charges, TA/DA for faculty members and coordinators, classroom and laboratory hiring charges for the contact program.

I. Quality assurance mechanism and expected programme outcomes

The syllabus is prepared considering the need and expectations from various stakeholders, feedback, and consultation with academicians, industry experts, scholars from relevant field. The teaching and learning methods incorporate contact classes, online and offline methods. Hands-on training is provided for practical orientation and independent project work stimulates problem analysis, techniques for resolving the problem and probable solutions to the same providing opportunities to apply theoretical knowledge to real time problems in organizations. The evaluation incorporates transparency and all activities are carried out according to preplanned academic calendar. The syllabus has clear defined course objective and course outcome for each of the courses.

Program Outcome:

- The students will be technically and critically trained with practical exposure to perform both the plant and animal culture, which is the at most required in this field of science, skilled candidates are absorbed in well established and commercial tissue culture units.

- Agricultural literates of tissue culture have the ability to set up their own laboratories for the propagation of the plants which is the need in the society
PG Diploma in Tissue Culture - Syllabus

SEMESTER I

Paper I: FUNDAMENTALS OF PLANT TISSUE CULTURE

Unit 1: INTRODUCTION TO PLANT TISSUE CULTURE
Unit 2: LABORATORY DESIGN AND STERILIZATION TECHNIQUES
Unit 3: TISSUE CULTURE MEDIA AND PREPARATION
Unit 4: CONCEPTS OF TISSUE CULTURE
Unit 5: INITIATION OF PLANT TISSUE CULTURE

Paper II: TECHNIQUES IN PLANT TISSUE CULTURE

Unit 1: MICROPROPAGATION
Unit 2: CULTURE OF REPRODUCTIVE STRUCTURES
Unit 3: SYNTHETIC SEED TECHNOLOGY
Unit 4: SOMACLONAL VARIATION
Unit 5: PROTOPLAST CULTURE AND SOMATIC HYBRIDIZATION

Practical 1: Fundamentals and Techniques of Plant Tissue Culture

1. Sterilization methods: physical and chemical
2. Preparation of various tissue culture media: MS and Rooting media
3. Explant preparation, inoculation and initiation of tissue culture
4. Callus formation, Multiplication and Organogenesis
5. Establishment of suspension cultures
6. Micropropagation – Meristem and Nodal culture

SEMESTER II

Paper III: INDUSTRIAL APPLICATION OF TISSUE CULTURE AND CONSERVATION OF GERM PLASM

Unit 1: SECONDARY METABOLITE PRODUCTION
Unit 2: BIOREACTORS/ FERMENTORS
Unit 3: PLANT TISSUE CULTURE INDUSTRY
Unit 4: GREENHOUSE HARDENING UNIT OPERATION AND MANAGEMENT
Unit 5: GERmplasm CONSERVATION
Paper VI: APPLICATIONS OF ANIMAL CELL CULTURE

Unit 1: INTRODUCTION TO ANIMAL CELL CULTURE: PRINCIPLES and APPLICATIONS
Unit 2: COMPOSITION OF ANIMAL CELL CULTURE MEDIA
Unit 3: CHARACTERIZATION OF CELLS IN CULTURE
Unit 4: GENERATION AND MAINTENANCE OF ANIMAL CELLS IN CULTURE
Unit 5: APPLICATIONS OF ANIMAL CULTURE AND IMMORTAL CELLS

Practical 1: Application of Plant and Animal Cell culture

1. Induction of somatic embryos: anther/ovary/ovule culture
2. Preparation of synthetic seeds
3. Protoplast isolation and Culture
4. Hardening and acclimatization in green house