



SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

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Department of Biotechnology		LP: VD22204
B.E/B. Tech/M.E/M.Tech : Biotechnology	Regulation: 2022	Rev. No: 00
UG Specialization : Biotechnology		Date: 09.06.2026
Sub. Code / Sub. Name : VD22204/ 3D Bioprinting		
Unit : I		

Unit Syllabus:**INTRODUCTION****6 hours**

Introduction to Design, Prototyping fundamentals, Introduction and Historical development to 3D printing, advantages. Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, Classification of 3D printing process, Applications to various fields.

OBJECTIVE: To introduce the concepts of 3D Printing and software modelling.

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Introduction to Design, Prototyping fundamentals	T1 (13-16)	BB & LCD
2.	Introduction and Historical development to 3D printing, advantages	T1 (14) J4	BB & LCD
3.	Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission	T1 (19-21)	BB & LCD
4.	Checking and preparing, Building, Post processing, RP data formats	T3 (21-22)	BB & LCD
5.	Classification of 3D printing process	T3 (23-31) J 1	BB & LCD
6.	Applications to various fields	T3 (34-41)	BB & LCD
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 minutes



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Sub. Code / Sub. Name : BT VD22204/ 3D Bioprinting
Unit : II

Unit Syllabus:**LIQUID-BASED 3D PRINTING****6 hours**

Stereo lithography apparatus (SLA): Models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies. Solid ground curing (SGC): Models and specifications, process, working, principle, applications, advantages and disadvantages, case studies.

OBJECTIVE: To study the aspects of liquid-based 3D printing.

Session No *	Topics to be covered	Ref	Teaching Aids
7.	Stereo lithography apparatus (SLA): Models and specifications, process, working principle	T2 (73-132) J5	BB & LCD
8.	photopolymers, photo polymerization, layering technology, laser and laser scanning	T4 (177-179)	BB & LCD
9.	applications, advantages and disadvantages	T2 (365-387)	BB & LCD
10.	case studies	T2 (333-363)	BB & LCD
11.	Solid ground curing (SGC): Models and specifications	T1 (138-145) J 2	BB & LCD
12.	process, working, principle, applications, advantages and disadvantages, case studies.	T1 (160-179) J 4	BB & LCD
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 mins



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Sub. Code / Sub. Name : VD22204/ 3D Bioprinting
Unit : III

Unit Syllabus:**SOLID-BASED 3D PRINTING****6 hours**

Laminated object manufacturing (LOM): Models and specifications, Process, Working principle, Applications and Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, Working principle, Applications and Case studies.

OBJECTIVE: To provide knowledge on solid-based 3D printing.

Session No *	Topics to be covered	Ref	Teaching Aids
13.	Laminated object manufacturing (LOM): Models and specifications	T1 (193-196) J 1	BB&LCD
14.	Process, Working principle, Applications	T5 (188-193)	BB & LCD
15.	Case studies	T1 (188-190)	BB & LCD
16.	Fused Deposition Modeling	T1 (212-215) J 2	BB & LCD
17.	Models and specifications	T5 (216-217)	BB & LCD
18.	Process, Working principle, Applications and Case studies	T2 (171-195)	BB & LCD
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 mins



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Sub. Code / Sub. Name : VD22204/ 3D Bioprinting
Unit : IV

Unit Syllabus: BIOMATERIALS IN 3D BIOPRINTING 6 hours

Introduction to Cells, Tissues, Organs and ECM, In-Vitro Cell Handling for 3D Bioprinting, Types of Cells used in 3D Bioprinting and their limitations, In-Depth Understanding of Hydrogels and Biomaterials.

OBJECTIVE: To acquire knowledge on the concepts of bioprinting and its types.

Session No *	Topics to be covered	Ref	Teaching Aids
19.	Introduction to Cells, Tissues, Organs and ECM	T2 (469-487)	BB & LCD
20.	In-Vitro Cell Handling for 3D Bioprinting	T2 (488-509)	GCR / BB & LCD
21.	Types of Cells used in 3D Bioprinting	T3 (687-702)	BB & LCD
22.	3D Bioprinting limitations	T2 (520-527) J3	BB & LCD
23.	In-Depth Understanding of Hydrogels	T3 (527)	BB & LCD
24.	Biomaterials	T2 (528)	GCR / BB & LCD

Content beyond syllabus covered (if any): Importance of aseptic condition in industries

* Session duration: 50 mins



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Sub. Code / Sub. Name : VD22204/ 3D Bioprinting

Unit : V

Unit Syllabus:**CROSSLINKING AND SCAFFOLD****6 hours**

An Introduction to Crosslinking, importance and application, Types of Scaffolds and Scaffold Design.

OBJECTIVE: To study the application of cells, crosslinking and scaffold designing in bioprinting.

Session No *	Topics to be covered	Ref	Teaching Aids
25.	An Introduction to Crosslinking	J5	GCR / BB & LCD
26.	importance of Crosslinking	J5	BB & LCD
27.	Application of Crosslinking	T1 (820-825) J 1	BB & LCD
28.	Types of Scaffolds I	T3 (188-190)	BB & LCD
29.	Types of Scaffolds II	T4 (207-212)	BB & LCD
30.	Scaffold Design	T4 (235-255)	GCR / BB & LCD
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 mins

**TEXT BOOKS:**

1.	3D Bioprinting - Fundamentals, Principles and Applications by Ibrahim Ozbolat 1st Edition, 2016.
2.	Bioprinting: Principles and Applications: 1 (World Scientific Series In 3d Printing) by Wai Yee Yeong and Chee Kai Chua, 2015.
3.	3D Printing: Applications in Medicine and Surgery Volume 2 by Vasileios N. Papadopoulos, Vassilios Tsioukas and Jasjit S. Suri, 2021.
4.	Extrusion Bioprinting of Scaffolds for Tissue Engineering Applications by Daniel X. B. Chen, 2019.
5.	Pugliese R, Beltrami B, Regondi S, Lunetta C. Polymeric biomaterials for 3D printing in medicine: An overview. Annals of 3D Printed Medicine. 2021

JOURNALS:

1.	Chia HN, Wu BM. Recent advances in 3D printing of biomaterials. Journal of biological engineering. 2015 Dec;9(1):1-4.
2.	Study on Micro extrusion-based 3D Bioprinting and Bioink Crosslinking Mechanisms, by Liliang Ouyang, 2020.
3.	Mancha Sánchez E, Gómez-Blanco JC, López Nieto E, Casado JG, Macías-García A, DíazDíez MA, Carrasco-Amador JP, Torrejón Martín D, Sánchez-Margallo FM, Pagador JB. Hydrogels for bioprinting: a systematic review of hydrogels synthesis, bioprinting parameters, and bioprinted structures behavior. Frontiers in Bioengineering and Biotechnology. 2020 Aug 6; 8:776.
4.	Gupta D, Negi NP. 3D bioprinting: Printing the future and recent advances. Bioprinting. 2022 May 18: e00211
5.	Zhang YS, Yue K, Aleman J, Mollazadeh-Moghaddam K, Bakht SM, Yang J, Jia W, Dell'Erba V, Assawes P, Shin SR, Dokmeci MR. 3D bioprinting for tissue and organ fabrication. Annals of biomedical engineering. 2017 Jan;45(1):148-63.



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	Prepared by	Approved by
Signature	N. Sathish 23/06/2026	Dr.E Nakkeeran 23/06/26
Name	Mr. N Sathish	Dr.E Nakkeeran
Designation	Assistant Professor	HOD
Date	09.06.2026	09.06.2026
Remarks *: The Same lesson plan will be followed in the subsequent year		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD