

Minutes of the Sixth Board of Studies Meeting
Held on 26th December, 2022 from 11:00 A.M. onwards
Department of Chemistry and Chemical Science, School of
Physical and Material Sciences

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The Sixth Board of Studies (BOS) Meeting of the Department of Chemistry and Chemical Science, SoPMS was held on 26th December, 2022 at Shalipur campus of Central University of Himachal Pradesh.

Professor Devender Kumar Sharma, Professor Department of Chemistry, H.P University Shimla, Professor Him Chand, Dean SOPMS, Professor Bhag Chand Chauhan, Professor Department of Physics and Astronomical Science, CUHP, Dr. Sunil Thakur, Professor and Head, Department of Animal Sciences, School of Life Sciences, CUHP, Dr. Rajender Kumar, Associate Professor, Department of Chemistry and Chemical Science, CUHP, Dr. Neeraj Gupta, Assistant Professor, Department of Chemistry and Chemical Science, CUHP and Dr. Vivek Sheel, Associate Professor and Head, Department of Chemistry and Chemical Science, CUHP were present in the Meeting.

Professor Shashi Kant Sharma expressed his inability to attend the meeting due to personal reason.

The Chairman started the meeting with introduction of Honourable Members of BOS and Following Business was transacted.

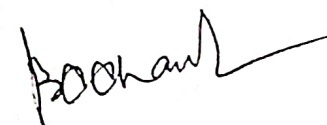
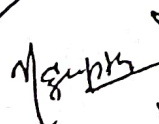
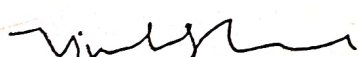
Agenda Item No. CCS-BOS-6/22-1: Confirmation of Minutes of 5th BOS meeting held on 23rd September 2021. The Minutes of the 5th BOS meeting held on 23rd September 2021 is given in Annexure I.

Resolution No. 1 : The Minutes of 5th BOS meeting held on 23rd September 2021 is given in Annexure I and are approved.

Agenda Item No. CCS-BOS-6/22-2: Renu Bala (14-ECM-855) PhD Student of Dr. Vivek Sheel, who was enrolled in his previous institute, Maharishi Markandeshwar (Deemed to be University) Mullana-Ambala has been awarded PhD degree in Chemistry. This information may be recorded in the department. The details of the award of degree of PhD in Chemistry are given in Annexure-II.

Resolution No. 2: Honourable Members approved that Renu Bala (14-ECM-855) PhD Student of Dr. Vivek Sheel, who was enrolled in his previous institute, Maharishi Markandeshwar (Deemed to be University) Mullana-Ambala has been eligible for the award of degree of PhD in Chemistry.

Agenda Item No. CCS-BOS-6/22-3: Modification and/or finalizing the course content of CCS 615 "SOFTWARE BASED DATA ANALYSIS" for M.Sc. 3rd Semester. The Syllabus of CCS 615; SOFTWARE BASED DATA ANALYSIS third Semester will be research related and will be assigned



on the basis of need of research project etc. Software training will be as per use and need of software will be related to Chemistry and Chemical Science. The syllabus detail is given in Annexure-III.

Resolution No. 3 : Honourable Members approved the modification and/or finalizing the course content of CCS 615 "SOFTWARE BASED DATA ANALYSIS" for M.Sc. 3rd Semester. The Syllabus of CCS 615; SOFTWARE BASED DATA ANALYSIS third Semester will be research related and will be assigned on the basis of need of research project etc. Software training will be as per use and need of software will be related to Chemistry and Chemical Science.

Agenda Item No. CCS-BOS-6/22-4: Splitting of course CCS 616 (8 Credits) for M.Sc. 3rd Semester into two courses as CCS 616; REVIEW OF LITERATURE / RESEARCH PROPOSAL (2 Credits) and CCS 617; REVIEW OF LITERATURE / RESEARCH PROPOSAL (LAB) (6 Credits) & approval of the syllabus of course CCS 616. The syllabus detail is given in Annexure-IV.

Resolution No. 4 : Splitting of course CCS 616 (8 Credits) for M.Sc. 3rd Semester into two courses as CCS 616; REVIEW OF LITERATURE / RESEARCH PROPOSAL (2 Credits) and CCS 617; REVIEW OF LITERATURE / RESEARCH PROPOSAL (LAB) (6 Credits) & syllabus of course CCS 616 are approved by Honourable Members.

Agenda Item No. CCS-BOS-6/22-5: Incorporation & Distribution of Marks of new course code CCS 617; REVIEW OF LITERATURE / RESEARCH PROPOSAL (LAB) for M.Sc. 3rd Semester. Distribution of marks for the course CCS 617 lab (Credits 6) is given below:

Mid Term Assessment (Presentation)	Internal Assessment	End Term Assessment (Presentation)	Total
60 Marks	60 Marks	180 Marks	300Marks

Note: The End term examination of 180 marks will be awarded on the basis of the evaluation of report on research proposal including the literature review. Both the components will have 60 marks each (60+60=120 marks) and the rest of 60 marks will be awarded after the final presentation.

Resolution No. 5 : Incorporation & Distribution of Marks of new course code CCS 617; REVIEW OF LITERATURE / RESEARCH PROPOSAL (LAB) for M.Sc. 3rd Semester are approved by Honourable Members.

Agenda Item No. CCS-BOS-6/22-6: Distribution of Marks of course CCS 627 (Credits 8) for M.Sc. 4th semester is given below:

Presentation	Viva	Dissertation	Total
50	100	250	400Marks

Resolution No. 6 : Distribution of Marks of course CCS 627 (Credits 8) for M.Sc. 4th semester are approved by Honourable Members.

Agenda Item No. CCS-BOS-6/22-7: Approval of the proposal for initiating the 6 Months Certificate Course in "BIOMATERIAL CHEMISTRY" by Department of Chemistry and Chemical Science. It is proposed to introduce Certificate Course by adopting NEP guidelines. The List of courses offered for the certificate course for session 2022-23 is given below:

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Sr. No.	Course Code	Course Name	Course Type	Credit
1.	CCS801	Polymer and Coating Technology	Value added course	04
2.	CCS 802	Biomaterials	Value added Course	04
3.	CCS803	Biomaterial Characterization Techniques	Value Added Course	04
4.	CCS 804	Organic Reactions for Synthesizing Biomaterials Lab	Value Added Course	02
5.	CCS 805	Biomaterials Lab	Value Added Course	02
6.	CCS 806	Bio Physical Chemistry Lab	Value Added course	02
7.	CCS 807	UV-visible Study of Biopolymers Lab	Value added Course	02

The syllabus is given in Annexure-V.

Resolution No. 7 : Honourable Members approved the proposal for initiating the 6 Months Certificate Course in "BIOMATERIAL CHEMISTRY" by Department of Chemistry and Chemical Science. It is proposed to introduce Certificate Course by adopting NEP guidelines.

Agenda Item No.CCS-BOS-6/22-8: Item from Chair. List of External Examiners.

Resolution No. 8 : The List of External Examiners approved by Honourable Members.

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W. Jyoti

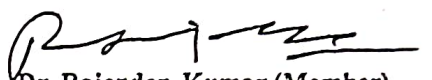
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Bachanika V. V. S.
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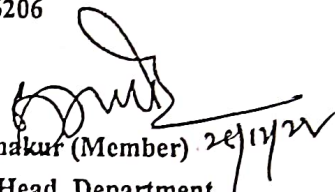
In the end Professor Devender Kumar Sharma, External Member suggested that as per the New Curriculum scheme which requires publication of Research Papers/Conference presentation etc. and research dissertation in 4th Semester will require tremendous infrastructure and financial support. Hence University may be requested to allocate grants for development of Infrastructure like Scientific equipment's, Software's, Computer systems, etc. so that required research environment could be created. All members appreciated this and approved to convey to university for necessary action.


approved by email (attached)

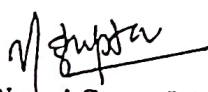
Dr. Devender Kumar Sharma (Member)
Professor (Retd.), Department of Chemistry
Himachal Pradesh University Shimla-05



Dr. Rajender Kumar (Member)
Associate Professor, Department of
Chemistry and Chemical Science
CUHP-176206


Dr. Him Chand (Member)
Dean SOPMS & Professor
Department of Physics and
Astronomical Science, CUHP-176206


Dr. Sunil Thakur (Member) 29/11/22
Professor & Head, Department
of Animal Sciences Science, CUHP-176206


Dr. Bhag Chand Chauhan (Member)
Professor, Department of Physics and
Astronomical Science, SOPMS, CUHP-
176206


Dr. Neeraj Gupta (Member)
Assistant Professor, Department of
Chemistry and Chemical Science
CUHP-176206


Dr. Vivek Sheel (Chairman)
Department of Chemistry and Chemical Science
CUHP-176206

215

16



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Central University of Himachal Pradesh

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ANNEXURE-I

Minutes of the Fifth Board of Studies Meeting

Held online via google meet on 23rd September, 2020 from 3:00 P.M onwards

Department of Chemistry and Chemical Science
School of Physical and Material Sciences



हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
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The Fifth Board of Studies (BOS) Meeting of the Department of Chemistry and Chemical Science, SoPMS was held via Google Meet (Online Medium) on 23rd September, 2021 at Shahpur campus of Central University of Himachal Pradesh.

Professor Shahshi Kant Sharma, Professor Department of Chemistry, H.P University Shimla, Professor Hum Chand, Dean SOPMS and Head Department of Physics and Astronomical Sciences, CUHP, Professor Bhag Chand Chauhan, Professor Department of Physics and Astronomical Science, CUHP, Dr. Sunil Thakur, Associate Professor and Head, Department of Animal Science, School of Life Sciences, CUHP Dr. Neeraj Gupta, Assistant Professor Department of Chemistry and Chemical Science, CUHP and Dr. Rajender Kumar, Associate Professor and Head, Department of Chemistry and Chemical Science, CUHP were present in the Meeting.

Dr. Devinder Kumar Sharma Couldn't attend the meeting due to prior commitment. However, he provided his valuable comments telephonically.

The Chairman started the meeting with Introduction of Honourable Members of BOS and Following Business was transacted.

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7
आज का दिन
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1. Agenda Item No. CCS-BOS-5/21-1: Confirmation of Minutes of 4th BOS meeting held on 28th December 2020.

Resolution No. 1 : The Minutes of 4th BOS meeting held on 28th December 2020 is given in Annexure I and are approved.

2. Agenda Item No. CCS-BOS-5/21-2: In principle approval of Modification/change/Addition etc of M.Sc Chemistry syllabus (2 Years programme from Academic Year 2021-22) as required in National Education Policy 2020. Various changes /revisions in syllabus from time to time will be reported in the ensuing BOS Meetings.

Resolution No. 2: Honourable Members deliberated at length and gave their in principle approval to design the syllabus for M.Sc Chemistry (2 Year Programme) in line with spirit of National Education Policy (NEP) 2020. Hence Approved.

3. Agenda Item No. CCS-BOS-5/21-3: Scheme of Syllabus for M.Sc. Chemistry two years (Session 2021-22), syllabus as per National Education Policy (NEP) and Guidelines provided by Central University of Himachal Pradesh Vide Committee formed in this respect.

Resolution No.3: Honourable members deliberated on the scheme at Length as given in Annexure II of 5th BOS Agenda. Professor, Shashi Kant Sharma, External Subject Expert suggested to make the scheme structure uniform and cohesive. The suggestions were incorporated and accordingly the agenda item is approved.

4. Agenda Item No. CCS-BOS-5/21-4: Detail Syllabus of Courses Semester wise. (Annexure III, IV & V)

Resolution No.4: Honorable members discussed the syllabus semester wise and provided their valuable inputs. As per suggestions of External Subject

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expert, Professor Shashi Kant Sharma the units in the syllabus were modified to make the units in all courses concise and uniform.

Further as per suggestion of Internal member **Dr. Sunil Kumar Thakur**, the syllabus will be remodified as and when future guidelines from university in this regard are released. **The Agenda Item is approved.**

5. Agenda Item No. CCS-BOS-5/21-5: Exit /Entry Option for M.Sc Chemistry Students after Completion of First Two Semester of course.

Resolution No.5: Professor B.C Chauhan, Internal Member suggested to change **Advanced Diploma in Chemical Sciences to Post Graduate Diploma in Chemical Sciences**. Accordingly the Students after completion of first two semester of M.Sc Chemistry Course will be awarded **Post Graduate Diploma in Chemistry**. The agenda item is approved with this modification.

6. Agenda Item No. CCS-BOS-6/21-6: Adoption of NEP Guidelines as Proposed by the Committee constituted by Central University of Himachal Pradesh for Implementation of National Education Policy 2020 from Academic Session 2021-22.

Resolution No. 6: Professor Shashi Kant Sharma suggested to make scheme for distribution of Marks for Various examinations and also to include multiple choice questions (MCQs) in Examinations. All members appreciated the suggestion and it was resolved that the uniform marks distribution and pattern of question papers will be followed as decided by Central University of Himachal Pradesh to have university wide uniformity. **Agenda Item Approved.**

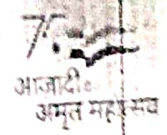
Shashi Kant Sharma
Dr. Sunil Kumar Thakur
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217

101



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7. Agenda Item No. CCS-BOS-5/21-7: Item from Chair: (1) For reporting and Noting of PhD Co-Supervisor ship of Dr. Manish Kumar at Sri.Sai University Palampur (H.P).

Resolution No. 7 (1): On basis of request received from Dr. Manish Kumar Assistant Professor, Department of Chemistry and Chemical Science, Central University of Himachal Pradesh, members noted the status of Dr. Manish Kumar as PhD Co-supervisor of Ms.Atul (Roll No. 714024001). The PhD viva-voce examination of Ms. Atul was held on 18-02-2020. at Sri.Sai University Palampur.

Item from Chair: (2) Scheme of PhD Course work from Session 2021 onwards as per NEP Guidelines (Annexure VII)

Resolution No. 7 (2): Approved

In the end Professor Shashi Kant, External Member suggested that as per the New Curriculum scheme which requires publication of Research Papers/Conference presentation etc and research dissertation in 4th Semester will require tremendous infrastructure and financial support. Hence University may be requested to allocate grants for development of Infrastructure like Scientific equipment's, Software's, Computer systems, etc so that required research environment could be created. All members appreciated this and approved to convey to university for necessary action.

by Email- (attached)
 Dr. Shashi Kant Sharma (Member)
 Professor, Department of Chemistry
 Himachal Pradesh University Shimla-05

by Email (attached)
 Dr. Devinder Kumar Sharma
 Professor, Department of Chemistry
 Himachal Pradesh University Shimla-05



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75
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Dr. Hum Chand (Member)
Dean SOPMS & Professor
Department of Physics and Astronomical
Science, CUHP-176206

Dr. Sunil Thakur (Member)
Associate Professor & Head, Department
of Animal Sciences Science, CUHP-
176206

Dr. Bhag Chand Chauhan (Member)
Professor, Department of Physics and
Astronomical Science, SOPMS, CUHP-
176206

Dr. Neeraj Gupta (Member)
Assistant Professor, Department of
Chemistry and Chemical Science
CUHP-176206

Dr. Rajender Kumar (Chairman)
Department of Chemistry and Chemical Science
CUHP-176206

(Deemed to be University), Mullana-Ambala

(Established Under Section 3 of the UGC Act.1956)
(Accredited by NAAC with Grade 'A++')

218

ANNEXURE-II

OFFICE OF THE CONTROLLER OF EXAMINATIONS

Result Notification No. Ph.D./22/376

It is hereby notified that on the recommendations of the Board of Examiners (who evaluated Ph.D. thesis) and the Research Degree Committee, the Vice-Chancellor vide his orders dated 07.10.2022 has been pleased to declare the following Research Scholar eligible for the award of degree of Doctor of Philosophy in the subject mentioned below.

Name of Scholar & Enrollment No.	Subject	Father's Name	Mother's Name	Supervisor(s)	Title of the Thesis
Renu Bala 14-ECM-855	Chemistry	Sh. Rameshwar Dass	Smt. Krishna Devi	Dr. Bhawna Pareek Co-Supervisor: Dr. Vivek Sheel	Innovative Synthetic Methods of Metal Oxide Nanoparticles, their Characterization and Applications

Mullana-Ambala
Dated: 10.10.2022

Controller of Examinations

Endst No. Result/22/ 448

Dated 10-10-2022.

Copy of the above is sent to the following for information and necessary action:

- 1 The Director, MMEC, MM (Deemed to be University), Mullana-Ambala.
- 2 The HOD, Chemistry, MMEC, MM (Deemed to be University) Mullana-Ambala. She is also requested to intimate the Supervisors.
- 3 Director, Information and Library Network Centre, Info-city Gandhi Nagar Ahmedabad 382009.
- 4 Editor, University News, Association of Indian Universities, AIU House, 16-Comrade Indrajit Gupta Marg (Kotla Marg), New Delhi-110002.
- 5 Dr. Sistla Rama Devi Panl, Editor, University News, Association of Indian Universities, AIU House, 16-Comrade Indrajit Gupta Marg (Kotla Marg), New Delhi-110002.
- 6 The Chief Co-Coordinator, Sodh Ganga, MM. (Deemed to be University), Mullana alongwith CD(s)/ Pen drive of the thesis. The date of Registration as per record is 06.01.2017.
- 7 The Dy. Registrar (Regn.), MM. (Deemed to be University), Mullana-Ambala
- 8 The Assistant Registrar (Result), MM. (Deemed to be University), Mullana-Ambala
- 9 P.A. to Vice-Chancellor / MD / Registrar / COB (for kind information of the Vice-Chancellor / MD Registrar / COE), MM. (Deemed to be University), Mullana-Ambala.

[Signature]
Asstt. Registrar (Secrecy)

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21 9

Annexure-III

Course Code: CCS 615

Course Name: SOFTWARE BASED DATA ANALYSIS

Credits: 4

UNIT-I

CHEM DRAW: Introduction, application and uses. Drawing of simple chemical structure. Analysis of their molecular weight and NMR spectra using Chem Draw. Converting 2D structure into 3D structure and calculating energy using Chem Draw.

UNIT II:

ORIGIN: Introduction and uses. Data uploading, plotting of graphs, Different types of graphs that can be plotted using Origin, Combining/separating the graphs in Origin, To plot 2D, 3D graphs from Excel sheet using ORIGIN, fundamental statistical analysis using ORIGIN.

UNIT III:

TURNITIN SOFTWARE: Introduction, application and uses. Web-based plagiarism detection software by the site Turnitin.com. to use Turnitin, to analyze the result after the plagiarism checking.

UNIT IV:

Software for analysis of NMR: Introduction, Use and application of MNova software for the analysis of NMR Spectra. Spectral analysis of ^1H NMR and ^{13}C NMR data using this software. Comparison of NMR analysis (^1H and ^{13}C) using Chemdraw and MasterNovasoftwares.



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220

Annexure-IV

Course Code: CCS 616

Course Name: Review of Literature/ Research Proposal

Credits: 2

UNIT – I: Literature Review

Importance of literature review, Classification of literature into primary and secondary sources, Difference between primary and secondary sources, various tools for doing literature search specifically the Sci finder and Google scholar.

UNIT –II: Research Proposal, Publications and dissertation

Basic information of a research publication. Types of research publications specifically the original research articles and reviews. Basic information of a research proposal. Different components of a research proposal, Difference between publication and proposal. Different components of a student dissertation and critical points to cover in each section.

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221

Annexure-V

Department of Chemistry and Chemical Science

Sr. No.	Name of Programme(s) of Study	Programme Duration	Credits Required	Intake	Eligibility
1.	Certificate Course in Biomaterial Chemistry	6 Months	20	30+3=33	10+2 with minimum 50% marks

Certificate Course Name: BIOMATERIAL CHEMISTRY (VALUE Added Course)

Course Code: CCS 801

Course Name: POLYMER AND COATING TECHNOLOGY

Credit 4

Total =200 Marks

Course Objectives:

- To understand the significant aspects Synthetic and natural polymers, Processing techniques and production of polymers
- To understand the Emerging technologies in polymers and coatings
- To explain various coating formulation types as well as Technology of construction chemicals

Course Outcomes

After completing the course students will be equipped with a basic understanding of:

CO¹ Synthetic and natural polymers, processing techniques along with the production of polymers

CO² How to select the appropriate coating components for the application

CO³ Emerging technologies in polymers and coatings, how to characterize and assess coating manufacture and product performance

CO⁴ How to differentiate between the various coating formulation types, technology of construction chemicals

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

- Mid Term Examination: 40
- End Term Examination: 120
- Continuous Internal Assessment: 40



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UNIT 1

SYNTHETIC RESINS: Chemistry and technology of synthetic resins viz. alkyds, polyester, phenolics, amino, acrylic and vinyl resins. raw materials for these resins. Chemistry of synthesis of these resins. processing techniques, properties and applications of these resins for surface coatings. **NATURAL RESINS;** Chemistry and technology of natural resins like rosin, shellac, bitumen, asphalts and coal tar, their modifications and uses.

UNIT 2

COATINGS-I: Classification of coatings, mechanisms of film formation in surface coatings. Technology of solvent based architectural and industrial coatings. Technology of water based paints and coatings: cement paints. Chemistry and technology of emulsion and latex paints, preparation of latex. Developments in water borne coatings.

UNIT 3

COATINGS-II:

Technology of varnishes and lacquers. Technology of powder coatings. Specific application paints and coatings: wood finishes, road marking paint. Automotive coatings, refinishes and novelty finishes.

UNIT 4

CONSTRUCTION CHEMICALS:

Technology of construction chemicals: adhesives and sealants. Water proofing compounds. Polymeric additives for concrete mixtures and curing compounds.

RECOMMENDED/REFERENCE BOOKS

1. P. Deligny, N. Tuck, *Resin for Surface Coatings*, Volume 1, 2 and 3, second edition, John Wiley and Sons, 2001.
2. T. J. Miranda, *Surface Coatings: Raw Materials and Their Usage*, Volume 1, third edition, Springer, 1993.
3. Z. W. Wicks, Jr., F. N. Jones, S. P. Pappas, D. A. Wicks, *Organic coatings: Science and Technology*, Wiley Interscience, 2007.
4. NIIR Board, *Modern Technology of Paints, Varnishes and Lacquers*, second edition, Asia Pacific Business Press Inc., 2007.
5. D. R. Bassett, A. E. Hamielec, *Emulsion Polymers and Emulsion Polymerization*, Volume 165, ACS, 1981.
6. M. Cowley, *Powder Coating: A Practical Guide to Equipment, Processes and Productivity at Profit*, SITA Technology, 1999.
7. K. Holmberg, *High Solids Alkyd Resins*, CRC Press, first edition, 1987.
8. P. Oldring, P. Lam, *Waterborne and Solvent Based Surface Coatings Resins and Their Applications: Acrylics*, Volume 1, first edition, SITA Technology, 1996.

Course Name: BIOMATERIALS
Course Instructor:
Credits: 4
Total = 200 Marks

Credits Equivalent: (One credit is equivalent to 10 hours of lectures / organized classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives:

- To analyse various fundamentals and classes of biomaterials in medical field.
- To understand physical and chemical properties of biomaterials.
- To understand interaction of immunoglobins with biomaterials and their effects.
- To apply the biological process of reactions and properties of biomaterials.
- To motivate and lead the student in the field of biomaterials.

Course Outcomes: After the successful completion of this course, the student will be able to

- CO¹ Discuss about properties of biomaterials in the field of orthopaedics.
- CO² Understand role of proteins and cells in tissue response to biomaterials
- CO³ Compare the various types of biomaterials and its applications.
- CO⁴ Discuss mechanical and biological interactions between bio materials and biologicals.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria (For 4 credit theory part):

Mid Term Examination: 40
End Term Examination: 120
Continuous Internal Assessment: 40

Course Contents

UNIT- 1

INTRODUCTION TO BIOMATERIALS [10 Hours]

Fundamentals of biomaterials science. Concept of biocompatibility. Classes of biomaterials used in medicine, basic properties, medical requirements and clinical significance. Disinfection and sterilization of biomaterials.



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UNIT- 2

PROPERTIES OF BIOMATERIALS [10 Hours]

Physico-chemical properties of biomaterials: mechanical (elasticity, yield stress, ductility, toughness, strength, fatigue, hardness, wear resistance), tribological (friction, wear, lubricity), morphology and texture, physical (electrical, optical, magnetic, thermal), chemical and biological properties.

UNIT- 3

ELEMENTS IN CONTACT WITH THE SURFACE OF A BIOMATERIAL [10 Hours]

Structure and Properties of blood, blood composition, detailed blood clotting mechanism, plasma proteins, cells, tissues. Brief introduction to immune system with relevance to biomaterials. Interaction of immunoglobins with biomaterials and their effect.

UNIT- 4

PHENOMENA AT THE BIOINTERFACES [10 Hours]

Molecular and cellular processes with living environment, blood-materials interaction, Short and long term reactions to the body. Methods to avoid hostile immune reactions. Biocompatibility.

SUGGESTED READINGS:

1. Br'echignac, C., Houdy., & Lahmani, M. (2007). *Nanomaterials and Nanochemistry*. New York: Springer Berlin Heidelberg.
2. Hosokawa, M., Nogi, K., Naito, M.; & Yokoyama, T. (2012). *Nanoparticle Technology Handbook* (II Edition). Elsevier.
3. Theodore, L. (2006). *Nanotechnology: Basic Calculations for Engineers and Scientists*. Hoboken: John Wiley & Sons. Inc., Publication.
4. Introduction to Nanoscience, J. Dutta, H.F. Tibbals and G.L. Hornyak, CRC press, Boca Raton, 2008.
5. Sulabha K. Kulkarni, (2014). *Nanotechnology: Principles and Practices*, Springer Publisher.

Course Code: CCS 803
Course Name: Biomaterial Characterization Techniques
Course Instructor:
Credits: 4
Total =200 Marks

Credits Equivalent: (One credit is equivalent to 10 hours of lectures / organized classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria (For 4 credit theory part):

Mid Term Examination: 40
End Term Examination: 120
Continuous Internal Assessment: 40

UNIT-I Scanning Electron microscopy

Reflection of light and image formation, how the different images are formed including digital images, introduction to electron microscopy and its types, Instrumentation for SEM and its one application in the field of bio-imaging.

UNIT-II Transmissions Electron microscopy

Fundamentals of TEM and HRTEM, Basic instrumentation technique and its one application in the field of bio-imaging.

UNIT-III X-Ray photo electron Spectroscopy

Fundamental theory involved in the analysis of XPS, Instrumentation and its application for probing the surface structure of heterogeneous materials.

UNIT-IV X-Ray Diffraction

Basic Principle and instrumentation of XRD. Different types of information obtained from XRD analysis and its application in the field of nanotechnology.



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- CCS 804 Organic reactions for synthesizing Biomaterials Lab** **Credit: 2**
The In-house manual will be prepared according to the requirement
- CCS 805 Biomaterials Lab** **Credit: 2**
The In-house manual will be prepared according to the requirement
- CCS 806 Bio Physical Chemistry Lab** **Credit: 2**
The In-house manual will be prepared according to the requirement
- CCS 807 UV-visible Study of Biopolymers Lab** **Credit: 2**
The In-house manual will be prepared according to the requirement



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224

Annexure-VI

List of External Experts

Names of the External Experts with address (Email id, Mobile no.)

- Dr. Pankaj Thakur, Special centre for Nanoscience, JNU, New Delhi, 110067, Ph. No: 9816266489,
 Email: chempank@gmail.com
- Dr. Sunil Kumar, Department of Chemistry, HP University, Shimla, 171005, Ph. No: 9418353476,
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- Dr. Vikas Bharti, Department of Chemistry, Hydro engineering college, Bandla, Bilaspur, Ph. No:
 8219548067, Email: vikas818@gmail.com
- Dr. Samjeet Singh, Department of Chemistry, RGM Govt Degree College Joginder Nagar,
 Ph.No: 9418144849, Email: samar23chem@gmail.com
- Dr. Vikrant Sharma, Department of Chemistry, HP University, Shimla, 171005, Ph. No: 9418210049,
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- Dr. Rajneesh, Department of Chemistry, DAV College Kangra, Ph. No: 7876427166, Email:
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- Dr Vinod Kumar Pathania, Dept of Chemistry, Central University of Punjab, Ph. No: 7018660635, Email:
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- Dr. Akhilesh Kumar Gupta, Department of Chemistry, Sikkim University, Gangtok, Tadong 737102, Ph.
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- Deepak B Salunke (Organic Chemistry), Assistant Professor, Chemistry Department, Panjab University
 Chandigarh, Ph. No.: 8195968252, Email: salunke@pu.ac.in
- Rohit Kumar Sharma (Organic Chemistry), Assistant Professor, Chemistry Department, Panjab University



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Dr. Jagram Meena, Assistant Professor, Physical Chemistry, Department of Chemistry, Gurukula Kangri University, Haridwar, Uttarakhand (India), Email: jagram.meena@gkv.ac.in, Ph : 9555881703

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