CENTRE FOR INTERDISCIPLINARY RESEARCH

In order to undertake the frontier level research in the field of Medical Science, the "**Centre For Interdisciplinary Research**" has been established at D. Y. Patil University, Kolhapur. The centre offers interdisciplinary science research programs leading to Medical research and the Ph.D. awards. To fill up the gap between under graduate and Ph.D. programme, the University has started post graduate programmes, M. Sc. Medical Physics and M.Sc. Stem Cells & Regenerative Medicine, M.Sc. Anatomy and M.Sc. Medical Biochemistry. The Centre has organized number of National and International conferences & workshops since its establishment. The objects of the Centre are:

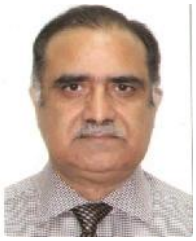
1. To make higher education more useful to society by organizing training and research programmes to produce skilled and knowledgeable manpower in the field of interdisciplinary studies with special emphasis on Medical Technology.
2. To develop a full-fledged infrastructure for undertaking R & D programmes of nanotechnology for applications in variety of fields.
3. To develop technology to fight against the cancer especially early detection of cancer by Electrochemical Impedance Analyzer and hyperthermia treatment to cure cancer.
4. To develop nanotechnology applications in artificial organs.

INNOVATIVE AND EMERGING AREAS OF RESEARCH

1)Nanobiotechnology
2)Nano-medicine
3)Cancer Nanotechnology
4)Nanobiosensors
5)Nano-Pharmacology
6) Developmental & Microbial Genetics
7)Electrophysiology
8)Clinical Embryology
9) Onco-Surgery
10) Otolaryngology
11) Medicinal Plants
12) Medical Physics
13) Stem Cell & Regenerative Medicine
14) Environmental Health Science and
15) Nano-Pediatrics

Ph.D./RESEARCH SUPERVISORS

Prof. (Dr.) S.H. Pawar (Emeritus Scientist) Nanomedicine, Nanobiotechnology, Medical Physics and Material Science 	**Dr. V. R. Wagh,** Medicine 
Dr. R. M. Kulkarni, Surgery, Oncology 	**Dr. Mrs. R. S. Mane,** ENT and Otolaryngology 
Dr. A. B. Kurane, Pediatrics and Nano Pediatrics 	**Dr. Mrs. A. A. Joshi,** Physiology and Bioelectrical Nanosensors 
Dr. B. M. Tiwale Biochemistry and Nanobiosensor 	**Dr. R. J. Khyalappa** Medicine and Diabetic wound healing 
Dr. S. J. Gosh Microbiology and Nanobiosynthesis 	**Dr. M. G. Joshi,** Stem Cell & Regenerative Medicine 
Dr. M. N. Ghatge, Surgery and Oncology 	**Dr. Mrs. P. N. Pawaskar** Nuclear Physics and NanoMedicine 
Dr. Mrs. A. D. Patil, Cell Biology 	**Dr. Mrs. Vaishali S. Patil** DNA Nanobiosensors 

Dr. Mrs. V. R. Nikam Anatomy, Cell Embryology, IVF 	**Dr. Mrs. Indumathi Somasundaram** Stem Cell & Regenerative Medicine 
Dr. N. T. Venugopal Biochemistry 	**Dr. S. L. Hoti,** Microbial Genetics 
Dr. R. K. Sharma, Obst & Gyn 	**Dr. Subarna Roy,** Microbial Genetics 
Dr. Rajesh K. Joshi, Natural Product Chemistry 	**Dr. Harsha Hegde,** Medicinal Plant Systematics, Ethnomedicine 
Dr. Banappa S. Unger, Pharmacology 	

Dr. Raghvendra A. Bohara, Biochemistry 	**Dr. Manisha Phadtare**
Dr. Arvind Gulbake	

RESEARCH ACHIEVEMENTS

RESEARCH ACTIVITIES IN PROGRESS

The Centre is running the Ph. D. and M.Sc. programmes in various areas of Medical Sciences and Stem Cells & Regenerative Medicine with thrust on Nanotechnology.

1. **Biological production and characterization of gold/silver nanoparticles (Au/Ag NPS) and their biomedical applications**

Au/Ag NPS are aptly called as 'Gold bullets' or 'Nanobombs' as they can emit intense heat due to their strong light absorbing property. This heat generated is sufficient to kill tumor cell. Au/Ag NP_S are also used for early detection of cancer and targeted therapy for cancer. The Ag NPs are well known for their antibacterial activity against pathogenic microorganisms. The biological production of Au/Ag NP_S is a green, non-toxic, and cheaper method as compared to the conventional methods. Certain types of micro-organisms including some bacteria, fungi and actinomycetes; plant part's extracts are utilized for the synthesis of Au/Ag NP_S under certain conditions. These NP_S are collected using suitable methods and are subjected for their characterization for their confirmation. Also microbial synthesis of polymer entrapped nanoparticles is done. As prepared nanoparticles are tested for respective properties. Antimicrobial property of Ag NPs is checked against pathogenic bacteria and fungi. Also toxicity of the biological synthesized nanoparticles are studied in-vitro on cell line for the assessment of the toxicity of these nanoparticles to the ecosystem.

2. **Synthesis and characterization of ferrite nanoparticles for hyperthermia cancer treatment**

Considerable efforts have been made to develop nanoparticles suitable for cancer hyperthermia applications. For biomedical applications, the use of nanoparticles that present superparamagnetic behavior at room temperature is preferred. It is planned to synthesize the ferrite nanoparticles which are suitable for hyperthermia treatment of cancer by simple reported method and characterization will be carried out by XRD, SEM, and EDAX etc. In the second part, it was planned to prepare the biocompatible drug formulation which will be carried out by micro emulsion, polymer coating or by surface passivation. All the surface functionalized magnetic nanoparticles were thoroughly studied for their induction heating abilities in order to use them for hyperthermia therapy application. These nanoparticles include magnetite, other ferrites and LSMO magnetic nanoparticles. *In vitro* biocompatibility was checked using different cell lines. *In vivo* studies are planned for these nanoparticles as our future perspective.

3. Determination of high energy gamma radiation: Radiological research

The study has done for the establishment of baseline radiation level in South Konkan comprises two districts as Sindhudurg and Ratnagiri. The radiation measurement for 150 villages have done for three years from 2010-2013. The three techniques have been used for the radiation measurement which are Thermo luminescent dosimeter, Gamma radiation survey meter and soil radioactivity Gamma spectrometer. The measurements are carried out for indoor and outdoor conditions using the TLDs and survey meter. In South Konkan, the soil radioactivity has been measured using gamma spectrometer. The radiation hazard indices have calculated to compare with worldwide data. The study has carried out on the environmental radiation surveillance to know whether there is any effect on human health or not.

4. Early detection of breast cancer with bioelectrical impedance spectroscopy

The bioelectrical impedance measurements are simple and non-invasive technique to analyze biological tissues to study their electrical properties such as resistivity and conductivity. It has wide range of applications in the field of biomedical science. It can be used to investigate and detect early stages of breast cancer.

5. Studies on development of plasma pyrolytic assisted disposal of medical waste

The work on plasma Pyrolysis of hospital waste is in progress. Plasma Pyrolysis is an ecofriendly technique which can be used for the treatment of hospital waste. Plasma Pyrolysis technique is used instead of incineration to avoid toxic gas emissions.

6. Synthesis and Characterization of magnetic nanoparticles using magnetotactic bacteria

Nanotechnology is increasing using both materials and nano-objects synthesized by living beings, most of them produced by microbial cells. The synthesis of metallic nanoparticles is an active area of academic and more importantly application research in nanotechnology. Accordingly, there is an essential need to develop environmentally benign procedures for

synthesis of nanoparticles of metallic nanoparticles. Therefore bacteria, plants, algae, fungi and viruses have been used for production of nanoparticles of low cost, energy efficient, and nontoxic metallic nanoparticles. The organisms have ability to accumulate metal ion inside the body and are able to synthesize particular metallic nanoparticles within the cell in presence of optimum parametric conditions. These NPs will be collected using suitable methods and will be subjected for characterization for their confirmation.

Magnetic nanoparticles (MNPs) find their applications in the wide areas of technical importance. These applications demand controlled size and magnetic properties which are dependent on the synthesis route adapted. Microbial synthesis meets all the requirements. Magnetotactic bacteria (MTB) are found to be one of the contenders in this route of synthesis which need to be explored for their potential in this direction. In the present work, the $CoFe_2O_4$ NPs (control cobalt doping in magnetosomes) was synthesized by magnetotactic bacteria. The isolation and cultivation has been studied in detail. The synthesized $CoFe_2O_4$ NPs by the isolated from strain characterize further for Hyperthermia therapy application.

7. Synthesis of magnetic nanoparticles for fabrication of electrochemical immunosensors for the detection of tumor markers

A tumor marker is a substance found in the blood, urine, or body tissues that can be elevated in cancer, among other tissue types. There are many different tumor markers, each indicative of a particular disease process, and they are used in oncology to help detect the presence of cancer. In the tumorous process, increased levels of tumor markers in human serum are associated in patients with certain tumors. So, the determination of level of tumor markers plays an important role in screening for a disease, in diagnosing a disease, and in determining the prognosis of a disease. Conventional ways of measuring these proteins include enzyme-linked immunosorbent assays (ELISA), radioimmunoassay (RIA), electrophoretic immunoassay and mass spectrometry-based proteomics. These techniques often involve sophisticated instrumentation, significant sample volumes, limited sensitivity, and clinically unrealistic expense and time. Thus, there is a real need for simple, rapid, sensitive and inexpensive methods for protein measurement for point-of-care and research applications.

8. Synthesis of Silica Nanocomposites for fabrication of electrochemical enzymatic biosensors for the detection of disease biomarkers

Biomarkers are the metabolites such as glucose, cholesterol, uric acid, etc. found in the blood, urine, or body tissues that increase in cardiovascular diseases, cancer, diabetes, infectious disease, musculoskeletal, neurodegenerative disease and so on. So, the determination of concentration of biomarkers plays a significant part in diagnosing a disease, and in the prognosis of a disease. Enzymes are most favorable candidate as a biorecognition element in the fabrication of biosensor because of its selectivity and sensitivity compared to conventional catalyst. The porous Silica nanocomposites are

particularly promising for fabrication of biosensors as it has a broad scope of physical characteristics such as high purity, tunable porosity, nanoscale structuring, high photochemical, physical rigidity and thermal stability. Silica nanocomposites retain native conformation and reactivity of biomolecules. The functional hybrid organic-inorganic nanocomposite is a favorable candidate for application in biosensing and catalytic devices due to their biocompatibility. Noteworthy, silica matrices offer many advantages as well-ease integration into the transduction platform in biosensing.

9. Synthesis and characterization of organic nanoparticles and Scaffolds for attachment with Mesenchymal Stem cells

Organic nanoparticles (NPs) are templated upon natural or synthetic organic molecules. Nature provides a wide range of examples of organic NPs such as protein aggregates, lipid bodies, milk emulsions, or more complex organized structures such as viruses, to name a few Organic NPs are also used in pharmaceutical formulations, that is, liposome vectors, polymersomes, polymer–protein, or polymer–drug conjugates. One of the most important features of organic NPs is that they offer relatively simple routes for the encapsulation of materials. This together with the fact that the molecules used for the fabrication of the organic NPs can be biodegradable makes organic NPs the most appealing systems for drug delivery and biomedical applications. Organic nanoparticles have specific importance over other inorganic nanoparticles which are biodegradability, non immunogenicity, non toxicity, bio-functionality and greater stability. Preparation of organic nanoparticles and scaffolds involves emulsification, desolvation, coacervation, and electro spray drying. By these methods, we can prepare nanoparticles and scaffolds which have various applications in medical field. Stem cells (Embryonic stem cells and Adult stem cells) have two important characteristics i.e. differentiation and regeneration that distinguish them from other types of cells. The combination of the stem cell and nanotechnology will provide breakthroughs in research for curing a wide range of diseases such as wound healing.

10. Lanthanum manganites for room temperature Magnetic Refrigeration

Magnetic refrigeration seems to be a promising technology for room temperature refrigeration. The compactness and efficiency are its key features. However, the complex nonlinear physics underlying the concept has frustrated experimental and numerical analysis for the past three decades. The literature has proven that the technology has potential, but understanding its principles and predicting its performance have been extremely difficult.

The motivation of present research work is to explore new materials for magnetic cooling. From the application point of view, attention is focused on finding potential refrigerants, specifically lanthanum manganites in order to establish the appropriateness for room temperature magnetic cooling application. The main motto is to gain a deeper insight into the fundamental relations between the MCE and magnetic phase transitions, compositions, electrical properties, role of synthesis method in MCE of LSMO. This may

serve as a guideline in the search of new materials suitable for room temperature magnetic refrigeration application.

11. Synthesis and Characterization of chitosan –Gelatin nanoscaffolds loaded with anti bacterial agents for would dressing application.

Wound infection is the major difficulty in the field of wound care management, because such infections can cause exudates formation, delay the wound healing and facilitate improper collagen deposition. The micro-organisms enter the body through the wounds and can reach into deeper portions of the tissue leading to internal infection. The solution to this problem would be the use of wound dressing with antibacterial activity. Here, an attempt is made to prepare wounding dressings by hydrogel method with advanced properties like maintaining moist environment at wound interface, providing a cooling sensation, allowing gaseous exchange, maintaining barrier to microorganisms, and allowing wound exudate absorption, biodegradability, hemostatic potential, and biocompatibility.

12. Green synthesis of Silver and Gold nanoparticles using different plant extract for biomedical application

Synthesis of noble metal nanoparticles using biological entities has great interest due to their physicochemical properties which are not observed either in individual molecules or in bulk metals. Silver and Gold nanoparticles exhibit strong absorption of electromagnetic waves in the visible range due to Surface Plasmon Resonance (SPR) which is highly influenced by shape and size of the nanoparticles. Various synthesis procedures for gold and silver nanoparticles have been explained by many scientists around the globe. We aim to focus on the biological synthesis of Silver and gold nanoparticles because method is environmentally friendly. The special interest on noble metal has been taken, since they don't undergo corrosion or oxidation easily. Silver and Gold nanoparticles were synthesized using various plant extracts, leaves and their biomasses. Silver nanoparticles have antibacterial effects, it inhibit the virus from binding to host cells. These nanoparticles can be incorporated in several kinds of dressing materials. The clothes with silver nanoparticles are sterile and can be useful in hospitals to minimize infection with pathogenic bacteria such as Staphylococcus aureus, Salmonella typhi, pseudomonas, E. coli etc. Gold nanoparticles have a good tunable shape and size dependent optical property which has been exploited in various surface coatings and biomedical applications.

13. One step synthesis of amine functionalized $CoFe_2O_4$ magnetic nanoparticles for high efficient cellular labeling.

For biomedical applications, the surface of magnetic nanoparticles (MNPs) needs to be suitably engineered to acquire improved colloidal stability in physiological media, biocompatibility, drug encapsulation ability and specific target ability to ensure proper interaction with cells or tissues. For this surface functionalization and the water solubility of nanoparticles are crucial. One step synthesis method has been always preferred over multi

step post synthetic grafting process as it may not be suited for bulky synthesis and frequent exposure of MNPs to harsh condition may affect the magnetic properties. In a second part considerable research will be devoted for combination of magnetic and fluorescent properties in a single nanocomposite, which could act as multi-targeting, multi-functional, tools and can be used in monitoring of living cells in situ.

14. Modified titania nanoparticles for visible light photocatalytic disinfection

The titanium dioxide photocatalytic process is a conceptually simple and promising technology. Particularly in areas of intensive medical use, regular and thorough disinfection of surface is required in order to reduce the number of bacteria and to prevent bacterial transmission. However, it can only work under ultraviolet light due to its wide band gap. The most efficient method to extend the photo response of titania into visible range is doping with transition metal ions. Anatase titanium dioxide nanoparticles doped with metal ions were synthesized by sol–gel method and characterized by various techniques. The bactericidal activity of metal-doped titania nanoparticles was tested against pathogenic bacteria under visible light irradiation. These nanoparticles preserved the option of environmentally benign photocatalytic activity using visible light and can be applicable for wastewater treatment, hospital, and environmental applications.

15. Synthesis of silver nanoparticles for fabrication of electrochemical immunosensors for the detection of carcinoembryonic antigen (CEA)

CEA is normally produced in gastrointestinal tissue during fetal development, but the production stops before birth. Therefore CEA is usually present only at very low levels in the blood of healthy adults. However, the serum levels are raised in some types of cancer, which means that it can be used as a tumor marker in clinical tests. Immunosensors are compact analytical devices in which the event of formation of antigen antibody complexes is detected and converted, by means of a transducer, to an electrical signal, which can be processed, recorded and displayed. Different transducing mechanisms are employed in immunological biosensors, based on signal generation (such as an electrochemical or optical signal) or properties changes (such as mass changes) following the formation of antigen-antibody complexes. The formation of the antigen-antibody labeled antibody complex is detected after the addition of the enzyme substrate and a proper redox mediator (cofactor). It is well known that silver (Ag) is the best conductor among metals (Kraus, 1922), and so Ag nanoparticles may facilitate more efficient electron transfer than any other nanoparticle in biosensors. That's why we use Ag nanaoparticles for preparation of of CEA-Immunosensor. This kind of work will focus on the research in immunoassay methods based on electrochemical detection of carcinoembryonic antigen(CEA).

MEMORANDUM OF UNDERSTANDING (MOUs) and ALLIANCE

1. MOU with Shanghai University, Shanghai, P.R. China (2011)

Second MOU with Shanghai University, Shanghai was signed on the project entitled **"Electrochemical Nano-immunosensors for early Detection of Tumer Markers"**.

Objectives of the collaborative programme

1) Exchange of visits both of Research Scholars and Scientists.
2) Interactive meetings both at D. Y. Patil University, Kolhapur, India and Shanghai University, Shanghai, PR China
3) Design and fabrication of electrochemical Nano-immunosensors
4) Testing of electrochemical Nano-immunosensors for its optional performance.

2. MOU with Patki Research Foundation & Hospital, Kolhapur (2012)

MOU with Patki Research Foundation & Hospital, Kolhapur was signed for "Strengthening of Research work in Stem Cell & Regenerative Medicine"

Objectives of the collaborative programme

1) To exchange the visits both of Research Scholars, Scientists and Students.
2) To arrange interactive meetings both at D. Y. Patil University, Kolhapur and Patki Hospital and Research Foundation.
3) To conduct nanotechnology applications in Stem Cell research.
4) Make joint collaboration with medical research schools and organization in India and abroad for expanding the horizon of research

3. MOU with the Assam Kaziranga University, Jorhat, Assam, India (2013)

MOU with Assam Kaziranga University, Jorhat, Assam was signed for "To promote and to coordinate the mutual interest in the fields of research, development, etc and dissemination of knowledge for the Students and Faculty"

Objectives of the collaborative programme

1) Collaborative academic programs and academic services.
2) Collaborative research programs.
3) Exchange of information by means of sharing of research activities, publications.
4) Holding of joint academic events such as seminars / workshops and conferences.
5) Exchange of information of the various industrial and institutional collaborations of the institutions with other organizations.
6) Efforts will be made to share information about on-going research activities in order to establish contacts and collaboration between professionals working within the same field.

7) Assistance of DYPU to KU in the fields of pharmaceutical science, microbiology, nanotechnology, biotechnology, environmental and health sciences, medical physics, stem cells and regenerative medicine and nursing courses.

4. **MOU with** Kolhapur Cancer Centre**, Kolhapur (2013)**
   MOU with Kolhapur Cancer Centre, Kolhapur was signed for "Research and Training in Radiation Therapy"

5. **MOU with** Quantum Photonic Science Research Centre, Hanyang University, Seoul, Korea **(2014)**
   MOU with Quantum Photonic Science Research Centre, Hanyang University, Seoul, Korea was signed for the project entitled "Core-shell magneto-plasmonic nanoparticles for biomedical applications"

   Objectives of the collaborative programme

   The general objectives of this agreement is to establish long-term research collaboration in fields which are compatible with the orientation of each institutions, and which are relevant to the industrial, scientific, social and cultural interests and needs of the countries in which the parties are respectively located. The initial focus will be in Nanoscience and Technology for health and technological applications

6. **Anglia Ruskin University, Cambridge, UK.**

Objectives of the collaborative programme

- Investigating avenues of working together in the field of postgraduate medical education.
- Exploring opportunities for ARU to provide training and development courses for teachers from DYPU.

7. **Centre of Excellence for MicroPhotonic Systems Edith Cowan University, Australia**

8. **Centre for Medical Radiation Physics University of Wollongong, Australia.**

9. **MOU with Shri Siddhivinayak Ganapati cancer Hospital, Miraj**

10. **MOU with REGIONAL MEDICAL RESEARCH CENTRE(INDIAN COUNCIL OF MEDICAL RESEARCH) BELAGAVI (Karnataka)**
11. **MOU with University of Wollongong, Australia.**

COLLABORATIONS

In order to grow the research activities in the Centre for Interdisciplinary Research we have collaborated with various institutions in India and abroad

- ➔ Department of Biochemistry and National Key Laboratory of Pharmaceutical Biotechnology, Nanjing University, Nanjing, Shanghai, P. R. China.
- ➔ Health Physics Division, Health Safety and Environment Group, Bhabha Atomic Research Center-Mumbai.
- ➔ National Physical Laboratory, New Delhi.
- ➔ Department of Physics, Department of Chemistry and Department of Environmental Science,, Electronics, Shivaji University, Kolhapur.
- ➔ Cambridge English Language Assessment, UK

PUBLICATIONS

In the last five years, we have published more than 200 research articles in reputed national, international journals,

1.	International publications	179
2.	National Publications	52
3.	Review articles	12
		243

RESEARCH PROJECTS

1. Projects: Completed, Ongoing and Submitted

a. Research Projects Completed

Sr. No.	Research Project Title	Funding Agency	Principal Investigator/Co-Investigator	Outlay (Rs in lakhs)
1	"Soft Electrochemical Processing and Microwave Studies of MgB2 and Ba1-xKxBiO3 Superconductivity Films"	CSIR, New Delhi	Prof.Dr.S.H.Pawar	10.33
2	"Medical Exposure to the population around proposed Nuclear Power Plant Site at Jaitapur, due to diagnostic applications"	BRNS, Mumbai	Dr.R.J.Khyalappa, Professor Dr.Mrs. M.A.Burande, Professor	27.14
3	"Studies on Establishment of Baseline Levels of Radiation & Radioactivity and Assessment of Radiation Doses Due to Natural and Fallout Radioactivity Around JNPP up to A Distance Of 30 Km From Site"	BRNS, Mumbai	Prof.Dr.S.H.Pawar Dr.Mrs. P.N.Pawaskar *Asst. Professor*	51.01
4	"Baseline Survey on Epidemiological Aspects In Jaitapur Region"	BRNS, Mumbai	Dr.V.S.Patil *Professor* Dr. V. R. Patkar *Asst. Professor*	26.39
5	"Studies on Development of SmSrCoO3/ BiCuVOx / Ni-SDC Planner Solid Oxide Fuel Cell"	DRDO, New Delhi	Prof.Dr.S.H.Pawar	24.00
6	"Soft Electronical Processing of MnAs Based Nanocomposites for Near Room Temperature Magnetic Refrigeration"	DST, New Delhi	Prof. Dr.S.H.Pawar	24.59
7	"Fabrication and performance studies of co-planar single chamber SmSrCoO3/BiCuVOx/Ni-SDC SOFC unit cell"	DRDO, New Delhi	Prof.Dr.S.H.Pawar	4.81

8	"Development of an electrochemical immunosensor using functionalized magnetic nanoparticles for detection of tumor markers"	DST, New Delhi	Prof.Dr.S.H.Pawar Dr. S. A. Murchite *Assoc. Professor*	89.30
9	"Studies on Synthesis of CoFe2O4 magnetic nanoparticles using magnetotactic bacteria for biomedical applications"	DST, New Delhi	Prof.Dr.S.H.Pawar Dr. Smt. S. J. Ghosh *Assoc. Professor*	20.78

b. Research Projects Ongoing

Sr. No.	Research Project Title	Funding Agency	Principal Investigator/Co-Investigator	Outlay (Rs in lakhs)
1.	"The South Asia – Anglia Partnership – working together to collaborate, innovate and enhance internationalisation of the student experience"'	British Council	Prof.Dr.S.H.Pawar	38.41
2.	"Study of PU/PVDF Nanoscaffolds Loaded with Anti-Microbial Agents for Wound Dressing Application?	UGC, New Delhi	Ms. Jagruti Meshram, Centre for Interdisciplinary Research	10.44
3.	Major histocompotibility complex class I related antigen A and B(MICA/B): biomarkers study for cancer	DST, New Delhi	Dr. M.G. Joshi, Assoc. Professor, Stem Cell & Regenrative Medicine.	36.31
4.	UGC –NET- JRF	UGC, New Delhi	Mr. Nayeem Mulla	6.90
5.	INSPIRE DST Fellowship	DST New Delhi	Mr. Abhinandan Patil	6.90
6.	"MicroRNA profiling of human endometrium at tissue and cellular level: Identifying the microRNA regime regulating stem cell proliferation and differentiation in endometrial hyperplasia conditions"	SERB New Delhi	Dr. Indumathi Somasundaram	20.25
7.	UGC –NET- SRF	UGC, New Delhi	Mr. Shivaji Kashte	

CONFERENCES AND SEMINARS ORGANIZED

- National Workshop on "Role of Engineering in Medical and Allied Sciences", 22-23 November, 2007
- Awareness Program on "Nuclear Energy & Environment" (APNEE) 12th April, 2008.
- International Conference on Biomedical engineering and Nanotechnology-08 (ICBENT)-21st -23rd October, 2008.
- Commercialization of Renewable Energy Technology (CRET)- a multi mega event-21st -23rd October, 2009.
- Technical Progress Discussion Meeting (TPDM-09) by BRNS, - 19th-21st November, 2009.
- International Conference on Nanoscience and Medical Sciences (ICNAMS) 21st -23rd October, 2010.
- Recent Advances in Bioelectrical Impedance and Clinical Applications (RABICA-2011)
- National Symposium on "Nuclear Energy & Health Care" , A Multi-Mega Event, (NEHCA-2011) 22-24 October, 2011
- National Workshop on "Ph.D. Programmes for Medical Innovations", (PPMI-2012), 18-19 October, 2012
- International Workshop on "Ph.D. Programme for Medical Innovations"(IWPPMI-2014), 16th -17th February, 2014
- conference on **CAD conference - AMI Conclave 2014** on 24th Aug, 2014.
- CME on "Recent advances in Oncology" on 10th January 2015 by Dept. of Medical Physics
- "Workshop on Application of Statistics in Medical Research" on 19th & 20th January 2015 by University Research Cell.
- "6th International Seminar on Recent Advances in Oncopahtology" on 3rd & 4th January 2015 by Department of Pathology.
- "National Science day" celebrated by Dept. of Physiology on 27th & 28th February 2015.
- Campaign On University Research & Training (COURT-2015) on 18th February 2015 by University.
- Annual meet on D. Y. Patil University, Kolhapur on 18th February 2015.
- PGCON-2015 by Dept. of Anesthesia on 07th & 08th February 2015

- SECOND M.B.B.S. ALLIANCE FOR RESEARCH & TRAINING (SMART-2015) on 26th August 2015 organized by School of Para-clinical Medical Sciences.
- National Conference on Convergence of Stem Cells and Medical Nanotechnology (CSCN-2015) on 2nd & 3rd September 2015 organized by Dept of Stem Cell & Regenerative Medicine and Dept of Medical Physics.
- "DYPU Anveshan-2015: Student Research Convention" on 29th December 2015 organized by Centre for Interdisciplinary Research.
- "National Seminar on Andrology Updates-2016" organized by dept of Pathology on 20th March 2016.
- National Conference on "Alternative & Complementary Therapies-Portal to Futuristic Clinical Practice" (ACT-2016) organized by D. Y. Patil College of Nursing, Kadamwadi, Kolhapur on 19th & 20th February 2016.
- "Campaign on University Research & Training (COURT-2016)" organized by D. Y. Patil University, Kolhapur on 18th February 2016.

Ph. D. Thesis

Awarded

1. A. B. Salunkhe, Studies on synthesis of $Co_{1-x}MnxFe_2O_4$ nanoparticles by chemical route for Biomedical Applications, 2012.
2. V. M. Khot, Synthesis of Magnesium Ferrite Nanoparticles and Studies on their Induction Heating for Biomedical Applications, 2014.
3. M. R. Phadatare, Studies on synthesis of $Ni_{1-x}Zn_xFe_2O_4$ nanoparticles and their nanofluids for hyperthermia therapy applications, 2014.
4. N. D. Thorat, Studies on Preparation and Properties of Superparamagnetic LSMO Nanoparticles for Hyperthermia Application, 2014.
5. Seema Dhawal, Environmental High Energy Radiation Studies in South Konkan, 2014.
6. Prajakta Shete, Functionalization of Iron Oxide Nanoparticles with Chitosan and Acrypol for Cancer Hyperthermia Therapy Application, 2014.
7. Sachin Otari, Studies on Biological Synthesis of Silver Nanoparticles for Biomedical Applications, 2014.
8. Vidya Karande, Studies on microbial synthesis of $CoFe_2O_4$ magnetic nanoparticles for biomedical application.
9. Hemraj Yadav, Antibacterial Studies with Metal-Doped TiO_2 Nanoparticles.
10. Swati Jadhav, Studies on synthesis and surface functionalization of LSMO Nanoparticles for Biomedical Application.
11. Dipali Nikam, Effect of Surface Coating on $Ni_{1-x}Zn_xFe_2O_4$ Nanoparticles for Biomedical Application.
12. Rakesh Patil, Inorganic-organic core-shell structures with iron oxide nanoparticles for biomedical applications.
13. Ms. Satvekar Rajashri Kundlik, “Studies On Development and Performance of Silica Nanocomposite Based Enzyme Nanobiosensors”
14. Sonali Rohiwal, Synthesis and Characterization of Albumin/Dextran Nanoparticles, their Conjugate and Attachment with Mesenchyamal Stem Cells Derived from Human Umbilical Cord for Biomedical Application.
15. Raghvendra Bohara, Studies on Functionalised Monodisperse Cobalt Ferrite ($CoFe_2O_4$) Nanoparticles for Biomedical Applications.

Ongoing

1. Rupali Patil, Studies on Isolation of Magnetotactic bacteria and synthesis of magnetite Nanoparticles for Hyperthermia Therapy Application.
2. Sneha Kumbhar, Synthesis of PLGA-dextan/PLGA-Alginate nanoparticles & preparation of scaffolds for seeding human umbilical cord derived mesenchymal stem cells for biomedical applications.
3. Abhinav Raut, Albumin-chitosan nanoparticle synthesis & attachment with Mesenchymal stem cells derived from human umbilical cord for in-vitro studies for heart diseases.
4. Arpita Pandey Tiwari, Enhancement in concentration of DNA by different functionalized iron oxide nanoparticles.
5. Shilpa Biradar, Green Synthesis of Silver and Gold Nanoparticles using Different Plant Extracts for Biomedical Applications.
6. Shruti Deshakar, Study on Role of Periconiella Fungus Species in Hospital Waste Treatment.
7. Priti Ghute-Patil, Studies on Synthesis and Characterisation of $MnFe_2O_4$ Nanoparticles and their application in Electrochemical DNA Nanobiosensor.
8. Valmiki Koli, Antibacterial Studies of TiO_2/Carbon Nanotubes Heterojunction Nanocomposites.
9. Jagruti Meshram, Study of PU/PVDF Nanoscaffolds Loaded with Anti-Microbial Agents for Wound Dressing Application.
10. Priyanka Patil, Studies on Preparation and Characterisation of Silk Fibroin Nanofiber Scaffolds Loaded with Antimicrobial Agent for Wound Dressing Application.
11. Mr.Abhinandan Patil, *"Studies On Development Of Unistrain Probiotics For Anticancer And Antioxidant Activity"*
12. Mr.Prashant A. Sonar, *"Studies on $Cd_{1-x}Zn_xTe$ Thin-Film Based Radiation Detection for Cancer Treatment"*
13. Dr. Baad Rajendra Krishna, Synthesis of Graphene Nanofilm on toothsurface for preventation of dental caries
14. Mr. N.Munirathinam, *"Study of Flattened and Flattening Filter Free Beam Based Advanced Treatment Techniques in Radiation Cancer Therapy"*
15. Mr. A. David Perianayagam, *"Dosimetric Studies of 2D Linear Detector Array System as a Pre-Treatment Verification Method for IMRT and VMAT in Head and Neck Cancers"*
16. Mr. Darade Milind M., *"Studies On Surface Coatings Buildings for Health Care"*
17. Mr. Santosh D. Kumbhar, *"Studies On Radioactivity in Multistorey Buildings and It's Effect on Human Health"*
18. Mr. Gaji Annaso Bharmu, *"Studies on Graphene-Cds Composites for Hospital Liquid Waste Treatment"*
19. Dr. Patil Snehdeep Sarjerao , *"Studies On Nanotechnology Based early Diagnostics of Tuberculosis"*
20. Dr. Gune Anita Rahul, *"Studies on Nanotechnology Based Detection of Mutations in GJB2 Genetic Congenital Hearing Loss"*

21. Dr. Kulkarni Suhas Panditrao, *"Development and Characterization of Polymeric Nanoparticle Based Budesonide Dry Powder for Bronchial Asthma"*
22. Dr. Karmalkar Arun Shankar, *"Effects of Cell Phone Radiation on Developing Tissues of Chick Embryo-A Histological Study of Kidney, Brain and Lungs"*
23. Mr. Sawant Deepak Vitthal, *"Studies on Early Detection of Mycobacterium Tuberculosis (MTB) Using Nanotechnology"*
24. Ms. Singh Priyanka, *"Studies on Development of Silica Coated Silver Nanoparticle Based CEA-Immunosensors"*
25. Mr. Mulla Nayeem Aslam, *"Biological Synthesis of Selenium Nanoparticles and Evaluation of their Antimicrobial Activity"*
26. Dr.Patil Sunita Sunil, *"The Studies on Multifunctional Nanoparticles of Vincristine Delivery in Cancer Therapy"*
27. Mr. Jadhav Ananda Ramchandra, Studies on Thin Film Based Radiation Detector for High Energy Radiation in Medical Applications
28. Ms. Amanjot Kaur, Studies on Radiation Shielding considerations of installations housing advanced radiotherapy equipments
29. Mr. Thirunavukkarasu Mani, Practical Three-Dimensional Dosimetry for Radiation Therapy.
30. Ms. Mahadik Ashwini Pratap, Studies on ($CO_{0.5}Zn_{0.5}Fe_2O_4$@$MgFe_2O_4$) Nano Core shell for cancer cell extinction.
31. Mrs. Momin Taihaseen Mehbubali, Synthesis & Characterization of ZnO QD's- Alginate Composite for Targetted Drug Delivery
32. Ms. Sujata R. Kadam, Study of Electrochemical Nanosensor for Measuring Exhaled Nitric Oxide
33. Dr. Vaishali A. Mane, Study on Role of Nanoparticles in sperm Morphology and Motility for IVF.
34. Dr. Supriya Prashant Satpute, Effect of Heparin on Capacitation of Sperm and role of Nanotechnology in IVF
35. Ms. Aruna Yadav, Study of Lectins Coated Magnetic Nanoparticles on Sperm for in Vitro Fertilization (IVF) in Male Infertility.

AWARDS AND APPRECIATIONS

1. NAAC "A" Grade with CGPA 3.09
2. The University has been awarded "Best University Award-2013" by the Europe Business Assembly-The Club of Rectors of Europe during 16th to 19th December 2013 at Oxford (UK).
3. Best Paper presentation award at 19th AGM MRSI, SCTIMST, Thiruvananthapuram.
4. Best Paper presentation award at ICNAMA 2008, Shivaji University Kolhapur.
5. Best Paper presentation award at ISMC-08, BARC, Mumbai.
6. DST-ITS award to Mr. Rajeev Joshi to attend the International Conference on Materials for Advanced Technology (ICMAT-2009) at Singapore.
7. DST-ITS award to Mr. Kiran Shinde to attend the International Conference on Materials for Advanced Technology (ICMAT-2011) at Singapore.
8. DST-ITS award to Prof. S. H. Pawar to deliver invited talk at BIT's 2nd Annual Congress of Nanomedicine-2011, Shenzen China.
9. Mrs. A.G. Bhosale, Best Paper presentation award at ICNAMS-2010, D.Y.Patil University, Kolhapur.
10. Mrs. Archana Meshram, Best Paper presentation award at ICNAMS-2010, D.Y.Patil University, Kolhapur.
11. Department of Science & Technology, New Delhi INSA-ISRO Travel Fellowship Award to Mr. N.D. Thorat for attending the International Conference on Young Researchers on Advanced Materials, 1-6 July, 2012 (ICYRAM-2012), Singapore.
12. Senior Research Fellowship (SRF) Award to Mr. V.M. Khot by Council of Scientific and Industrial Research, New Delhi 2012-2014
13. Vice-Chancellor's Life Time Achievement Award by World Management Congress and Commonwealth of Distance Education Summit, Delhi
14. Two Research Papers were featured in "Top 20 Articles, in the Domain of Article 23138108, since its Publication (2013)". The details are as follows:

    At No. 8. " Induction heating studies of dextran coated MgFe2O4 nanoparticles for magnetic hyperthermia. Khot VM, Salunkhe AB, Thorat ND, Ningthoujam RS, Pawar SH. Dalton Trans; 2013 Jan 28;42(4):1249-58.

    At No.9. "Functionalization of La(0.7)Sr(0.3)MnO3 nanoparticles with polymer: studies on enhanced hyperthermia and biocompatibility properties for biomedical applications. Thorat ND, Khot VM, Salunkhe AB, Ningthoujam RS, Pawar SH. Colloids Surf B Biointerfaces; 2013 Apr 1;104:40-7
15. Mr. Hemraj Yadav, Ph.D. Scholar has been secured 1st Rank in Avishkar 2013-14 orgnised by Shivaji University, Kolhapur on 23rd December, 2013

16. Dr. B. C. Patil, Best Paper Presentation in National Otology Conference, ISOCON-2014, Chennai.
17. Campus Preparedness Award-2015 from "Campus Management Engineering Watch" Pune on 31st March 2015.
18. The University has been awarded **"Campus Preparedness Award"** on 31st March 2015 by Higher Education, Forum, Pune, Chapter, Pune (West Zone)
19. D. Y. Patil, University has been awarded with Best University in Innovative Initiative for Medical Research with trust on Nanotechnology award in third "**CMAI CCI Technology Education Excellence Awards2015"** the award was given during the Afro-Asian conclave organized by Global Business studies of Gujrat Technological University and CMAI Association of India on 17th July 2015.
20. D. Y. Patil Medical College Kolhapur has been ranked at 49 amongst all medical colleges in the country and ranked 15 amongst all Medical deemed to be Institutes in the Country, as scientifically served by the Times of India, in 2014-2015.
21. Prof. S. H. Pawar has been honored by "Swami Vivekananda National Award-2015" organized by Yuva Samuha Wardha for contribution in higher education system.
22. Prof. (Dr.) S. H. Pawar, Vice-Chancellor, has been Sanctioned Financial Assistance for participating in Mini-Micro-Nano-Dosimetry and Innovation Technologies in Radiation Oncology in Hobart, Tasmania.
23. Dr. Sachin Kadam has been awarded with distinguish Scientist Award by Society for Bioinformatics and Biological Sciences, India for year 2015.
24. Dr. Mrs. Indumathi Somasundaram, has been sanctioned by SERB a research project as "Young Scientist" and financial assistance of Rs. 20,25,000/-

RESEARCH FACILITIES AVAILABLE AT CENTRE

Impedance analyzer

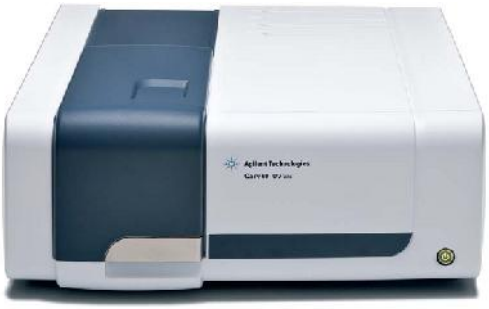
Planetary ball mill

Oven

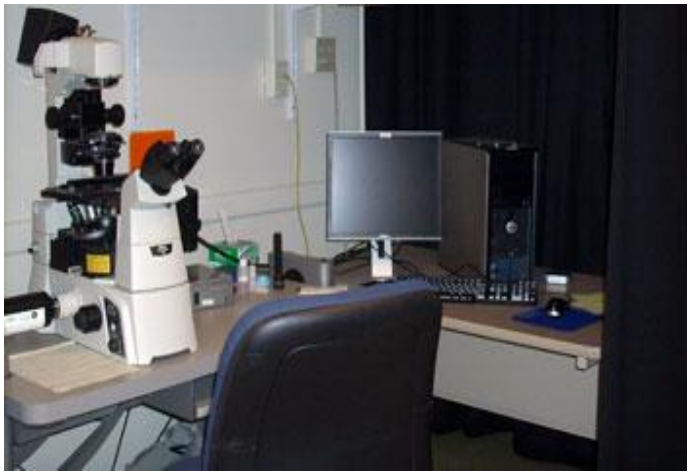
Particle size Analyzer with Zeta potential

Vacuum sealing unit 	 **Muffle furnace**
 **Double distillation plant**	 **TLD Reader**
 **Programmable high temperature furnace**	 **Autoclave**

 **Electrochemical work station**	 **Laminar airflow**
 **Shaking Incubator**	 **Gamma ray Survey meter**
 **Microplate reader**	 **Digital Microscope**

 **X-ray Diffractometer**	 **Zeta Potential & Particle Sizer**
 **Auto Titrator**	 **Zeta Potential Particle Sizer With Autotitrator**
 **Magnetic Nanoparticle Hyperthermia Unit with Variable Frequency**	 **UV Visible Spectrophotometer**
 **Pocket Dosimeter**	 **Survey Meter**

 **CO_2 Incubator**	 **Deep Freeze**
 **Elisa Reader**	 **Elisa Washer**



Nikon Ti-S Inverted Epifluorescence Microscope with Phase Contrast

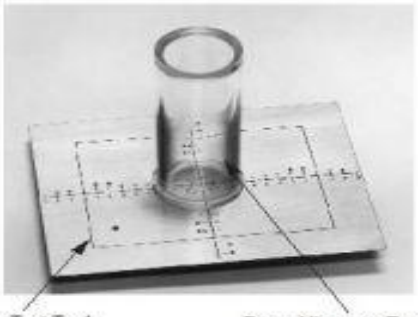
Cooling Centrifuge

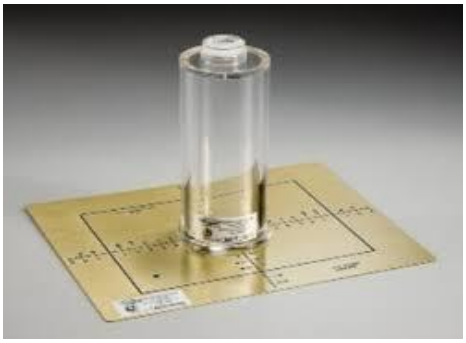
Olympus Inverted Compound Microscope

Incubator

Orbital Shaker

Invitrogen Western Blotting Assembly





QA KIT

Ph.D. PROGRAMMES

PRE - Ph. D. COURSES

The Candidates registered for Ph.D. degree are required to complete Pre-Ph.D. Course consisting of three papers before submission of the Ph.D thesis

Pre-Ph.D. Course Structure

Basic Sciences

PH 1.1 Research Methodology and Experimental Techniques:1

PH 1.2 Nanoscience and Biomedical Applications

PH 1.3 Elective 1: Paper related to specialization of Ph.D. thesis

Pre-Clinical (Anatomy, Physiology & Biochemistry)

PH 2.1 Research Methodology and Experimental Techniques:2

PH 2.2 Nanoscience and Pre-Clinical Applications

PH 2.3 Elective 2: Paper related to specialization of Ph.D. thesis

Para-Clinical (Pathology, Microbiology, FMT, Pharmacology & PSM)

PH 3.1 Research Methodology and Experimental Techniques:3

PH 3.2 Nanoscience and Para-Clinical Applications

PH 3.3 Elective 3: Paper related to specialization of Ph.D. thesis

Surgery & Allied

PH 4.1 Research Methodology and Experimental Techniques:4

PH 4.2 Nanoscience and Surgical Applications

PH 4.3 Elective 4: Paper related to specialization of Ph.D. thesis

Medicine & Allied

PH 5.1 Research Methodology and Experimental Techniques:5

PH 5.2 Nanoscience and Medicinal Applications

PH 5.3 Elective 5: Paper related to specialization of Ph.D. thesis

Engineering & Medicine

PH 6.1 Research Methodology and Experimental Techniques:6

PH 6.2 Nanoscience and Bioengineering Applications

PH 6.3 Elective 6: Paper related to specialization of Ph.D. thesis

M. Sc. PROGRAMMES

M. Sc. MEDICAL PHYSICS

ABOUT THE DEPARTMENT

The Department of Medical Physics under the umbrella of Center for Interdisciplinary Research offers M.Sc. and Ph.D. programs in Medical physics specialized in radiation technology applied to cancer therapy since 2011in collaboration with Kolhapur Cancer Centre and Shri Sidhdhivinayak Ganapati Cancer Hospital, Miraj. The purpose of medical physics program is to promote the application of physics to medicine and biology towards application in health care particularly in radiation cancer therapy, encourage R & D in medical physics and related fields and develop man power.

We have well-established laboratory coupled with sophisticated hi-tech instruments like TLD reader, X-ray diffractometer, Diagnostic QA kit, Pocket Dosimeter, Portable Radiation Survey meter, Geiger Muller counting system with radioactive source kit, Lead and Aluminum absorber sheets etc. The faculties from the department of medical physics of the university, Kolhapur cancer centre, D. Y. Patil Hospital and Shri Sidhdhivinayak Ganapati Cancer Hospital, Miraj conducts the theoretical as well as practicals of the medical physics students at the university as well as hospital.

About the course:

M. Sc. Medical Physics course, being a specialization course designed to train the young pool of PG students as qualified medical physicist and radiation safety officers (RSO) in the field of cancer radiation therapy. Medical physics is one of the fastest growing areas of employment for physicists. They play a crucial role in radiology, radiation therapy and nuclear medicine. These fields use very sophisticated and expensive equipment and medical physicist or responsible for much of its plan, execution, testing and quality assurance.

The M.Sc. medical physics students are getting the exposures form the various cancer hospitals during practicals and their M.Sc. Project work. Our students are exposed to field training in various cancer hospitals all over India. After completion of the 2 years course, students undergo one year internship according to AERB regulations in order to work as a Medical Physicist in the hospital.

Careers:

- The students have tremendous opportunities to work as a clinical medical physicist in various leading hospitals all over India with attractive salary packages.
- They can also work as dosimetrists in various companies providing radiation measuring devices.
- The students also have opportunities to pursue higher studies in foreign countries.

❖ COURSE CURRICULUM

SEMESTER I

MP.1.1 Mathematical Physics
MP.1.2. Solid State Physics
MP.1.3. Electronics And Instrumentation
MP.1.4. Classical And Quantum Mechanics
Practical lab course
MPP101 (Group A)
MPP102 (Group B)
Total Semester Marks: 600

SEMESTER II

MP.2.1 Electrodynamics
MP.2.2. Nuclear Physics
MP.2.3. Radiation Physics & Radiation Generators
MP.2.4 Anatomy And Physiology
Practical lab course
MPP201 (Group A)
MPP202 (Group B)
Total Semester Marks: 600

SEMESTER III

MP.3.1. Radiation Detectors And Instrumentation
MP.3.2. Radiation Dosimetry & Standardization.
MP.3.3. Clinical And Radiation Biology
MP.3.4. Medical Imaging
Practical lab course
MPP301 (Group A)
MPP302 (Group B)
Total Semester Marks: 600

SEMESTER IV

MP.4.1. Nuclear Medicine And Internal Dosimetry
MP.4.2. Radiation Therapy - Teletherapy Treatment planning
MP.4.3. Radiation Therapy – Brachytherapy Treatment Planning.
MP.4.4. Radiation Safety
Practical lab course
MPP401 (Group A)
MPP402 (Group B)
Total semester marks: 600

Third Year Residence Training & Project

Project	Course	Total Project period (Years)	Credits
MP501	Project-1	1	8

The candidate shall be awarded the degree of Master of Science in Medical Physics after completi ng the course and meeting all the evaluation criteria

Total Marks for Sem. –I, II, III, IV - 2400 marks

MP = Medical Physics.

M.Sc. STEM CELL AND REGENERATIVE MEDICINE

About stem cell Department

Dept. of Stem cells, Centre for Interdisciplinary research, D.Y. Patil University is the first such Department in the University's history and all over Kolhapur. The ultimate goal of our Department is to impart best research and teaching facility for the faculty members and students respectively. We are excited to advertise for our M.Sc Stem cell and Regenerative Medicine course for the coming 2016-2018 batch. We aspire that our budding students in the department will be the upcoming leaders in the field of stem cell and regenerative biology.

We have well-established cell-culture laboratory coupled with sophisticated hi-tech Intruments such as CO2 incubator, fluorescent microscope, ELISA reader, western blotting, real-time PCR and so on. We have well experienced faculties and trained teaching assistants to help students get a better career. Besides, two faculties Dr. Meghnad Joshi and Dr. Indumathi Somasundaram has their own DST project, which is currently on-going. Besides, we also have few internally-funded projects going on. Thus, students will get more exposure on research areas as well in our Department with better publications.

About the course

M.Sc Stem cells and Regenerative Medicine course, being a specialization course, imparts in-depth knowledge to the students on different types of stem cells, its in-vitro and in-vivo applications, scope and hope of stem cells and so on. Besides, being an Interdisciplinary course, our syllabus also involves other subjects such as developmental biology, cell and molecular biology, tissue engineering, biochemistry, immunology and so on, thereby creating acquaintance on all subjects in a single roof.

Scope of the Course

- Extensive theoretical and practical knowledge on Stem cells and Regenerative biology
- Exposure to sophisticated instruments
- Research level projects with indexed International publication
- Students are encouraged to pursue PhD after completion of the Master's degree.
- Wide Job opportunities in stem cells and biomedical field

Increases the opportunities to pursue higher studies in foreign countries

Research activities of stem cell department

Department of Stem Cells and Regenerative Medicine, with its state of the art facility has several on-going research activities.

The key areas of research of this Department are:

1. Gene regulatory profiles of human endometrium in health and diseases.
2. Inherent angiogenic potency of endometrial stem cells : Implications in vascular diseases
3. Generation of Tissue Engineered products such as Veins, Arteries, Skin, Cartilage, liver and kidney.
4. Preparation of tissue engineered scaffolds from cadaveric and animal organs.
5. Chick embryo as a model to study cancer and angiogenesis

PUBLICATIONS

The Department focuses on indexed impact factor journal publication and book publications. More publications are in pipeline. Besides, there are several book chapters and 2 International springer books published through our faculty from the Department.

COURSE CURRICULUM

SEMESTER-I
SCRM 1.1 Cell Biology & Molecular Biology
SCRM 1.2 Transplant Immunology & Genetics
SCRM 1.3 Biochemistry
SCRM 1.4 Anatomy and Physiology
Practical –1 Cell Biology, Molecular Biology, Immunology and Genetics
Practical – 2 Biochemistry, Anatomy, Histology & Physiology
Total semester marks: 600

SEMESTER-II

SCRM 2.5 Cell Physiology & Metabolism
SCRM 2.6 Biomedical Instrumentation
SCRM 2.7 Biomaterials, Medical Nanobiotechnology & Tissue engineering
SCRM 2.8 Animal Models, Biostatistics & Bioinformatics
Practical – 3 Cell Physiology, Metabolism and Bio-Medical Instrumentation
Practical-4 Biomaterials, Medical Nanobiotechnology and Tissue Engineering, Animal Models of Human diseases and Biostatistics & Bioinformatics
Total semester marks: 600

SEMESTER-III

SCRM 3.1 Developmental Biology
SCRM 3.2 Basic animal stem cell biology
SCRM 3.3 Basic plant stem cell biology
SCRM 3.4 Cell & tissue banking and cryopreservation
Practical -5 developmental biology and animal stem cell biology
Practical –6 Basic Plant stem cell Biology, Cell & Tissue Banking & Cryopreservation *Total Semester Marks: 600*

SEMESTER-IV

SCRM 4.1 Embryonic & adult stem cell biology
SCRM 4.2 Disease & Applications of animal stem cells
SCRM 4.3 Recent advances and applications of plant stem cell
SCRM 4.4 Clinical research, Bioethics and Regulatory affairs.
Practical -7 Embryonic and adult stem cell Biology, Diseases and Application of Stem Cells
Practical -8 Recent Advances and application of Plant Stem Cell , Clinical Research, Bioethics, Regulatory affairs
Project (Viva will be conducted at the time of practical)
Total Semester Marks: 600

Total Marks for Sem. –I, II, III, IV = 2400 marks

***SCRM = Stem* Cell & Regenerative Medicine**

M.Sc. Anatomy

COURSE CURRICULUM

SYLLABUS FOR MSC ANATOMY

A. Goal: To prepare the postgraduate student to become an exemplary teacher and a research scientist par excellence. To achieve this goal, the postgraduate student in **MSc Anatomy** should be given an overall exposure to the subject, teaching methodologies and a sound grounding in research technologies.

B. Learning objectives: To achieve this goal, the following objectives must be fulfilled.

I. Cognitive domain: At the end of three years of postgraduate training the student should be able to

1. Describe the gross anatomy of the human body and correlate the knowledge of structure and function.
2. Describe the microanatomy including cytology of various structures of the human body and compare the knowledge of microstructure with function and interpret it accordingly.
3. Interpret the anatomical basis of symptoms and signs of clinical conditions, diagnostic procedures and treatment modalities.
4. Describe the developmental aspects of human body and interpret the developmental basis of various congenital anomalies.
5. Describe the neuroanatomy in its entirety and interpret the neuroanatomical basis of various clinical conditions.
6. Explain various aspects of genetics and describe genetic basis of disorders and principles of genetics counseling.
7. Explain and interpret radiological anatomy and sectional anatomy of the human body as studied by various imaging techniques.
8. Comprehend surface and living anatomy of the human body.
9. Relate forensic anatomy to the study with medicolegal aspects of bone in particular.

10. Explain the general principles of Anatomy Act and Transplant of Human Organ Act.
11. Explain the process of embalming.
12 Comprehend ethical aspects of biomedical research.
13. Comprehend the basis of disposal of biomedical waste.
14. Comprehend horizontal integration of various subdivisions of anatomy with relevant physiology and biochemistry.

II. Psychomotor domain: At the end of the training, the student should be able to

1 Dissect and demonstrate various parts of adult human body
2. Demonstrate surface landmarks and living anatomy pertaining to mucle power, testing of nerves and palpating vessels.
3. Dissect and demonstrate various parts of a fetus .
4. Prepare tissue blocks ,perform H&E staining and is able to explain the principles of the following special stains -silver nitrate, periodic acid Schiff, osmic acid, Masson trichome, Verhoeff and Orcein stains .
5. Prepare and deliver lectures on various topics of human anatomy using audiovisual aids.
6. Operate computers so as to prepare documents, tables, charts and projection slides.
7. Identify research topics; carry out research and prepare a dissertation on a topic.
8. Present paper / poster in conferences.
9. Set undergraduate theory question paper, evaluate students and able to compute results including internal assessment marks.

III. Affective domain: At the end training the students should be able to

1. Co-operate with and react and respond in a cordial manner in his /her interaction with peers, superiors and subordinates.
2. Project a cheerful persona to the students.
3. Inspire the students to reach greater heights.
4. Arouse an element of curiosity and wonder in the minds of students.
5. Maintain a log book (Appendix - I).
6. Develop a healthy personality and a liking and respect for the subject.

C. **COURSE DESCRIPTION**

I. Eligibility: As per the guidelines of Medical Council of India and D.Y.Patil university, Kolhapur.

II. Duration: 3 years

III. Desirable qualities: The student should have an aptitude for teaching and reasonable command over spoken and written English language

IV. Details of Training: The P.G. student would be a resident in the department for 3 years. The time-plan and the proposed division of curriculum will be on the following lines.

1. FIRST YEAR OF RESIDENCY

a. Orientation programme- Institutional and departmental orientation including duties and responsibilities of a postgraduate student.

b. Time Management - should be conducted within 3-6 month.

c. Stress Management- should be conducted within 3-6 months.

d. **Gross anatomy**: Dissection of one whole human body and study of gross anatomy and acquisition of embalming skills.

e. **Microanatomy**: Basic techniques in tissue processing, preparation of blocks, microtome sections and H & E and principles of the following special stains - silver nitrate, periodic acid Schiff, osmic acid, Masson's trichome, Verhoeff and Orcein stains.

f. To attend all undergraduate lectures held in the department of Anatomy and all the lectures organized by the university by various PG teachers at different colleges.

g. To present the topic for dissertation and the research design in front of a dissertation committee comprising of all senior and PG teachers in the department within first six months of registration. Thereafter periodic assessment of the progress of the dissertation (every 6 monthly) will be done by the concerned PG teacher and if required, by the dissertation committee.

h. Get trained to use computer for teaching and use the internet

i. Scan Anatomy journals and periodicals.

j. **OPTIONAL yet DESIRABLE**: To attend all the orations/ seminars/ workshops held for the subject in the city colleges, attend general orations held in the institution and attend regional /national conferences.

k. **TEACHING**

i. 70 hours of small group teaching with at least l/3 of these under supervision by a senior teacher.

ii. **Microteaching sessions** are mandatory before small group teaching for each and every session.

iii. Should be exposed to evaluation techniques

iv. Exposure to Medical Education Technology Workshops

v. Presentation in Journal club.

vi. Presentation in Seminars and symposia.

vii. Should complete microanatomy and embryology journals.

l. **RESEARCH**

i. Basic techniques like review of literature for a given topic and collection of data.
ii. Exposure to computer for various applications.

2. II YEAR OF RESIDENCY

a. SPECIAL POSTING

Interaction with other pre, para and clinical specialties so as to prime the mind of the P.G. students in Anatomy to the growing needs of application of anatomical knowledge to other branches of medicine. This will be achieved through **horizontal and vertical integration**.

Posting

i. Horizontal Integration

(Selected topics should be taken as PG lectures by the concerned departments.)

Physiology and Biochemistry

ii. Vertical integration (Lectures to be arranged by the various departments for PG students)

Radiology, Surgery, Orthopaedics, Medicine, Obs &Gynac, Genetic Laboratory Pathology, Microbiology& Forensic.

(Posting in pathology - to gain knowledge about Frozen-sections, use of cryostat. special immunohistochemical techniques and immunological techniques and morbid and medicolegal anatomy from postmortem.)

During vacation.

b. RESEARCH

Starting the work on thesis by the beginning of second year of residency with the aim to complete the data collection & analysis by the end of second year.

c. TEACHING

i. From middle of IInd year, the P.G. students in Anatomy should be capable of giving lectures for the entire batch of students.
ii. Start teaching Embryology and Genetics in small groups after microteaching Sessions.
iii. Should be conversant with the use of various audiovisual aids.

d. Presentation in Journal Club

e. Presentation in Seminars / Symposia at the departmental and institutional level

f. FETAL DISSECTION: Should have dissected at least one fetus

3. III YEAR OF RESIDENCY

a. RESEARCH

i. Completion of Dissertation

ii. Presentation of paper in conference (optional but desirable)

iii. Writing articles for publication.

b. TEACHING

i. Full fledged lectures, lecture-demonstration, small group teaching

ii. Seminars / Symposia

iii. Journal Club

c. DISSECTION - Exercise in window-dissection of various regions.

1. Postgraduate curriculum shall include the entire undergraduate curriculum as spelt out below (Appendix III) with modifications as under:

Levels 1 & 2 of U.G. curriculum will become Level 1 of P.G curriculum.

Levels 3 of U.G curriculum will become Level 2 of P.G. Curriculum

Levels.3 of P.G. Curriculum will include current trend and recent advances in the

Concerned topic and historical aspects.

2. Additional topics to be covered

a. History of anatomy

b. Embalming techniques

c. Microanatomy

i. Principles and types of Electron microscopy: TEM, SEM

ii. Identification of various cell organelles and their EM appearance

a. Embryology: Stem Cell.

b. Genetics : a)Exposure to various DNA technologies, including cell culture, Karyotyping, Polymerase Chain Reaction (PCR) and Fluorescent-in-Situ-Hybridization (FISH)

c. Neuroanatomy: Limbic system and Reticular Systems - Details

d. Clinical Anatomy: Application of anatomical knowledge to explain the anatomical basis of various clinical symptoms and signs, diagnostic procedures and treatment modalities

e. Imaging Modalities

i. Radiology

ii. Ultrasonography (USG): - Principles of USG, Orientation of anatomical

organs, in various USG plates. Structures as seen in 2-D echocardiography

axes used and orientation of heart in various axes in 2-D echocardiography.

iii. PET scan: Principles.

f. Forensic Anatomy: Estimation of age and sex

i. With reference to bones including ossification

ii. With reference to radiology pictures

g. Cross-sectional Anatomy and its correlation to C.T. scan images and MRI images

h. Comparative Vertebrate Anatomy: Basic outline and detail systemic study.

l. Anthropology: Basic principles and anthropometry

D. EVALUATION

Evaluation of students for PG Degree M.D. Anatomy.

For postgraduate degree in Anatomy, the overall evaluation of students will consist of preliminary examination and the university examination at the end of the course.

Both examinations will have the same evaluation pattern for theory as well as practical.

University Examination

University examination shall be taken at the end of 36 months and shall have.

a) Four theory papers of 400 marks - 03 hrs duration

Paper I, II, III, & IV will have the following pattern -

06 SAQs of 10 marks each – 60 marks

02 LAQs of 20 marks each – 40 marks

Total - 100 marks

Paper – I	General Anatomy, General Histology General Embryology. Gross Anatomy of Upper extremity and Lower limb including applied anatomy.	100 marks
Paper – II	Gross anatomy of Thorax, Abdomen, Pelvis and Perineum including corresponding microanatomy, embryology including applied anatomy.	100 marks
Paper– III	Head, Neck and Face and Neuroanatomy including corresponding microanatomy,embryology and clinical anatomy	100 marks
Paper– IV	Comparative Anatomy,Genetics, Radiology, Embalming Museum techniques, Anthropometry	100 marks

Minimum passing marks in each head 40% and aggregate: 50% in all papers

Practical & Viva - 400 marks

i) First Day-

Morning session

Long case – Dissection and discussion - 100 marks

Afternoon session

Short case –

Histology slides – 100 marks

Embryology slides –

Neuroanatomy slides –

Genetics chart –

150 marks

Histology techniques

- Staining H & E 50 marks
- Use of Microtome

ii) <u>Second day</u> –

Morning session

Viva / Orals

Grand viva on soft parts, Neuroanatomy and osteology

- Radiology including CT scan, MRI, USG 100 marks
- Embryology Models
- Surface Anatomy
- Thesis

ii) Microteaching – Teaching on a given subject 50 marks

The candidate should submit log book, journal of Histology and Embryology of the time of university examination.

Minimum passing marks: 50% separate in Practical and viva voce

E. LIST OF RECOMMENDED BOOKS

I. Textbooks:

1. Cunningham's Manual of Practical Anatomy - Latest editions of volumes I, II, III
2. Regional & Applied Anatomy - R. J. Last
3. Clinical Anatomy for Medical Students - Richard Snell
4. Synopsis of Surgical Anatomy - McGregor
5. Functional Histology - Wheater, Burkit,
6. Langman's Medical Embryology
7. Embryology by Keith Moore
8. Clinical Neuroanatomy – Snell
9. The Human Nervous System - Murray Barr, John Kieman
10. Genetics by Emery
11. Human Genetics - S.D. Gangane
12. Essential of Human Genetics by Bhatnagar, Kothari and Mehta
13. Cross-sectional anatomy by Bo, Meehan and Kruger
14. Principles of General anatomy by A. K. Dutta
15. Comparative anatomy A.S. Romer.

II. Reference Books:

1. Gray's Anatomy
2. Clinical Anatomy _ NMS Series
3. Anatomy for Surgeons - Henry Hollinshead
4. Surgical Anatomy - Harold Ellis
5. Bailey's Textbook of Microscopic Anatomy
6. Embryology - Boyd & Mossman

7. Clinically oriented anatomy _ Keith Moore
8. Atlas of Human Histology – Di fiore
9. Tissues of the Human Body by Le Gros Clerk
10. Genetics by Thompson and Thompson
11. History of Anatomy - Charles Singer
12. History of Anatomy Indian Medicine - Kutumbiah
13. Dorlands Medical Dictionary

III. Journals:

1. Journal of Clinical Anatomy
2. Surgical & Radiological Anatomy
3. Journal of Anatomy
4. Development Dynamics
5. Anatomical Record
6. Journal of Anatomical Society of India

M.Sc. Medical Biochemistry

COURSE CURRICULUM

(Under the Faculty of Medicine)

Goal :

The broad goal of teaching & training of postgraduate students in Medical Biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the applications of the knowledge acquired in solving clinical problems.

Scope :

M.Sc. (Medical) Biochemistry will be an intensive three years post-graduate degree course primarily for graduates in the biological sciences which should facilitate them for teaching and research in health education sciences. At the end of his/her training, the student shall be able to take up a career in health teaching institutions as a faculty for Medical and allied courses or in diagnostic laboratory or in research.

Eligibility :

M.B.B.S./B.Sc.with Chemistry/Biology/Zoology/Biochemistry/Biotechnology/BAMS/BHMS, B.Pharm, B.Sc. from a recognized university, provided further that candidates seeking admission to M.Sc.(Medical) Biochemistry must have passed H.Sc. examination with Biology as one of the subjects.

Duration of the course :

The total duration of the course will be THREE years or six academic terms including orientation in Anatomy & Physiology in the Ist & IInd terms.

Period of training :

1. The period of training for M.Sc.(Medical) Biochemistry shall be of three years, that is, six academic terms after registration as a post graduate student.
2. M.Sc.(Medical) Biochemistry students shall attend all Lectures/Tutorials/and Practical's along with Ist M.B.B.S. students in the Ist year of M.Sc.(Medical) course. Orientation shall be given to these students in Anatomy and Physiology.

3. Candidates joining M.Sc.(Medical) Biochemistry course shall work as on his full time P.G. students during the training period. He/she will be given full time responsibility, assignments & participation in all facets of the educational process.
4. P.G. students shall maintain a record book/log book of the work carried out by them & will be checked & assessed by his/her P.G. teacher & H.O.D.
5. P.G. students shall work in central laboratory & would carry out routine, emergency & special investigations during training period.
6. P.G. students shall participate in all P.G. activities viz. Seminars, Group discussions, Journal club, etc.
7. P.G. students will be required to participate in the teaching & training programmes of U.G. students.
8. The candidate presenting himself for the M.Sc.(Medical) examination for the first time shall submit a dissertation based on his own work under the guidance & direction of his P.G. teacher. No candidate will be allowed to appear for theory examination unless the dissertation is approved by all the referees who will also be the examiners for the theory and practical examination.
9. Training in basics of medical statistics & bioinformatics, medical ethics shall be imparted to the P.G. students.
10. P.G. students will be granted a term provided they put minimum 80% attendance during the academic term.

Course content :

1.The course will consist of a orientation programme in the first two academic terms mainly in Anatomy, Physiology & Basic Biochemistry. At the end of first year the student will take up a college level examination in all the three subjects mentioned above. This examination will be a 'Qualifying Examination' for appearing in the final M.Sc.(Medical) examination & passing in this examination will be mandatory for eligibility to take on final examination.

2.The second & third year will be devoted at the Department of Biochemistry and Will be involved in seminars, journal club and practical classes in the Department of Biochemistry.

3.After the registration as a P.G. student for M. Sc.(Medical) Biochemistry the

student will select a topic for dissertation related to a topic in the subject, series of clinical cases, records, laboratory study, discussion on a specific thing in consultation with & under the advice and guidance of his P.G. teacher.

The subject of dissertation along with synopsis (about 200 words) signed by P.G. teacher, H.O.D.,& Head of the institution will be submitted to the university.

The protocol committee as well as the ethical committee of the institution must approve the topic of dissertation.

The completed dissertation will be submitted to the university in the 5th term, that is, 6 months before the date of final examination.

4.At the end of sixth term, after fulfillment of the necessary conditions, the candidate will take on final examination leading to the the degree M.Sc.(Medical) Biochemistry. The final examination will consist ofTheory, Practical and Viva-voce on whole of the theory syllabus including dissertation.

Pattern of examination :

A : <u>THEORY EXAMINATION –</u>

The theory examination will be of 400 marks consisting of four papers of 100 marks & 3 hours duration each.

Paper I : General Biochemistry and Instrumentation including Historical Aspects

Paper II : Metabolism including Nutrition

Paper III : Clinical Biochemistry

Paper IV : Molecular Biology, Biotechnology & Recent Advances in Clinical Biochemistry

Each paper will have four questions of 25 marks each.

B : <u>PRACTICAL EXAMINATION AND GRAND VIVA –</u>

Practical examination will carry a total of 400 marks. It will be conducted Over a period of three days. The distribution of marks will be as follows-

Exercise I – Separation technique in Biochemistry : 50 marks
Exercise II – Isolation and characterization : 50 marks
Exercise III – Enzyme assay : 50 marks
Exercise IV – Routine investigation : 50 marks
Exercise V – Special investigation : 50 marks
Exercise VI – Identification of unknown : 30 marks
Exercise VII – Spot identification with comments : 20 marks
Exercise VIII – Journals : 30 marks
Exercise IX – Grand viva covering all topics including Dissertation : 70 marks

Standard of Passing :

Minimum marks for passing will be 50% separately in Theory and Practicals including Grand viva.

The class will be declared as follows :

Pass class – Candidates passing the university examination in more than one attempt

Second class – Candidates passing examination in first attempt & securing more than 50% but less than 65% marks

First class – Candidates passing examination in first attempt & securing more than 65% but less than 75% marks

Distinction – Candidates passing examination in first attempt & securing more than 75% marks

Laboratory Journals :

Student should maintain three Laboratory Journals viz. U.G. experiments, Routine clinical investigations and Special investigations separately for

the practical's done during the course and submit at the time of University examination after duly certified by the Head of the Department.

Clinical Biochemistry Laboratory Posting :

Every P.G. student in Biochemistry shall be posted to clinical Biochemistry laboratory where clinical investigations of the attached Hospital are done. Student will be trained in collection & preservation of samples, carrying out investigations, interpretation, reporting of the results and maintenance of records of investigations.