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APPENDIX-1

Matlab Code for gyroid structure

```
clear all
close all
clc

x_period = 1;
y_period = 1;
z_period = 1;

[x,y,z] = meshgrid(0:0.1:x_period*2*3.14159265359,
0:0.1:y_period*2*3.14159265359, 0:0.1:z_period*2*3.14159265359);
f = sin(x).*cos(y) + sin(y).*cos(z) + sin(z).*cos(x);

figure(1)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')

hold on

figure(2)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(2)

figure(3)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(-45,36)

fv = isosurface(x,y,z,f)
stlwrite('gfive.stl',fv)
```

Matlab Code for Primitive structure

```
clear all
close all
clc

x_period = 1;
y_period = 1;
z_period = 1;
```

```

[x,y,z] = meshgrid(0:0.1:x_period*2*3.14159265359,
0:0.1:y_period*2*3.14159265359, 0:0.1:z_period*2*3.14159265359);
f = cos(x)+cos(y)+cos(z);

figure(1)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')

hold on

figure(2)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(2)

figure(3)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(-45,36)

fv = isosurface(x,y,z,f)
stlwrite('gfive.stl',fv)

```

Matlab Code for Diamond structure

```

clear all
close all
clc

x_period = 1;
y_period = 1;
z_period = 1;

[x,y,z] = meshgrid(0:0.1:x_period*2*3.14159265359,
0:0.1:y_period*2*3.14159265359, 0:0.1:z_period*2*3.14159265359);
f = (cos(x).*cos(y).*cos(z)-sin(x).*sin(y).*sin(z));

figure(1)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')

```

```

hold on

figure(2)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(2)

figure(3)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(-45,36)

fv = isosurface(x,y,z,f)
stlwrite('gfive.stl',fv)

```

Matlab Code for IWP structure

```

clear all
close all
clc

x_period = 1;
y_period = 1;
z_period = 1;

[x,y,z] = meshgrid(0:0.1:x_period*2*3.14159265359,
0:0.1:y_period*2*3.14159265359, 0:0.1:z_period*2*3.14159265359);
f = (2.*(cos(x).*cos(y) + cos(y).*cos(z) + cos(x).*cos(z)) - (cos(x) + cos(y)
+ cos(z)));

figure(1)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')

hold on

figure(2)
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(2)

figure(3)

```

```
isosurface(x,y,z,f)
axis equal
xlabel('X')
ylabel('Y')
zlabel('Z')
view(-45,36)

fv = isosurface(x,y,z,f)
stlwrite('gfive.stl',fv)
```

BANARAS HINDU UNIVERSITY
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VARANASI, INDIA -221 005

ECR/526/Inst/UP/2014/RR-20 dt. 19.5.2020

No. Dean/2022/EC/ 3351

Dated: 03.06.2022

06

Dr. Sanjay Kumar Rai
Associate Professor
School of Biomedical Engineering
Indian Institute of Technology
Banaras Hindu University

Dear Sir,

The Ethics Committee meeting was held on 03.06.2022 at 3.00 PM in the Chamber of the Dean, Faculty of Medicine, IMS for Ethical clearance of the MD/MS/DM/M.Ch/MBBS/Ph.D/PDCC/fellowship/synopsis/Short Project/Project submitted by the following:

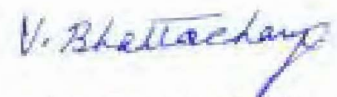
Name of the Student	Ms. Rati
Synopsis Title	FEA Based Prosthetic Optimization & Design
Suggestions/Comments	-
Remarks	The Synopsis is approved by the Institutional Ethics Committee

This is for your information and necessary action at your end.



(DR. KIRAN GIRI)
MEMBER SECRETARY

Yours sincerely,



(PROF. V. BHATTACHARYA)
CHAIRPERSON OF THE ETHICAL COMMITTEE

Publications

1. **Rati Verma**, Jitendra Kumar, Nishant Kumar Singh, Sanjay Kumar Rai, Kuldeep K. Saxena, and Jinyang Xu. "Design and Analysis of Biomedical Scaffolds Using TPMS-Based Porous Structures Inspired from Additive Manufacturing." *Coatings* 12, no. 6 (2022): 839. doi.org/10.3390/coatings12060839.
2. **Rati Verma**, Jitendra Kumar, Nishant Kumar Singh Sanjay Kumar Rai, Shekhar Kumta Shankar Sehgal, Kuldeep Saxena. "Low Elastic Modulus and Highly Porous TPMS Architected Implant 2 for Orthopaedic Applications." Part E: *Journal of Process Mechanical Engineering*, 09544089221111258. doi.org/10.1177/09544089221111258.
3. Jitendra Kumar, Nitesh Singh, **Rati Verma**, Nishant Singh, Neelamshobha Nirala, Sanjay Rai. "TPMS Inspired Porous Scaffold for Bone Defect Application: A Compromise Between Desired Mechanical Strength and Additive Manufacturability.": *Journal of Materials Engineering and Performance*, pp. 1-13. doi.org/10.1007/s11665-022-07322-1.
4. Durrani, Farhan, Arpit Galohda, Sanjay Kumar Rai, Nishant Kumar Singh, **Rati Verma**, Dhananjay Singh Yadav, and S. M. Karthickraj. "Evaluation and comparison of stress distribution around periodontally compromised mobile teeth splinted with different materials: Three-dimensional finite element analysis." *Indian Journal of Dental Research* 30, no. 1 (2019): 97. DOI: 10.4103/ijdr.IJDR_250_17.

Book Chapters

1. **Rati Verma**, Nishant Singh, Sanjay Rai, and Shekhar Kumta. "Triply periodic minimal surface-based porous scaffold design and analysis subjected to hard tissue reconstruction." In *Advances in Computational Methods in Manufacturing*, pp. 955-966. Springer, Singapore, 2019. DOI: 10.1007/978-981-32-9072-3_80

2. **Rati Verma**, Nishant Kumar Singh, Sanjay Kumar Rai, and Shekhar Kumta. "Triply periodic minimal surface porous implants to reconstruct bone defects." In Smart Healthcare for Disease Diagnosis and Prevention, pp. 21-28. Academic Press, 2020. doi.org/10.1016/B978-0-12-817913-0.00004-3.

Conferences

1. Two Concurrent Technical Conference & Exhibition on "Steel, Industrial Materials & Non-Metallics (Materials 2019) & "Welding & Fabrication Technology (WeldFab 2019)" on 25-26th April in Hotel Holiday Inn, New Delhi.
2. 4th International Workshop and Conference on "Biomedical Engineering and Assistive Technologies" on 11th–15th March, 2019 "Department of Biomedical Engineering, School of Technology North-Eastern Hill University (NEHU), (Central University), Shillong, Meghalaya, India.
3. 2nd International Conference on Computational Methods in Manufacturing, ICCMM-2019, March 8-9, 2019, Indian Institute of Technology Guwahati, India.
4. 8th World Congress of Biomechanics, 8th - 12th July 2018, The Convention Centre, Dublin, Ireland.

Workshops and Trainings

1. AICTE-ATAL WORKSHOP ON 3D PRINTING & DESIGN, sponsored workshop, October 5-9, 2019, in ABLT-1 classroom, IIT(BHU), Varanasi.
2. ISWT GIAN 13-Days Course, 2015 on "Orthopaedic Biomechanics: Implants And Biomaterials", 29th Nov to 11th Dec, 2015, IIT Kharagpur.
3. Online Seminar on Medical 3D Printing in Research and Engineering, 16th June 2022, 9.30 AM - 5.00 PM