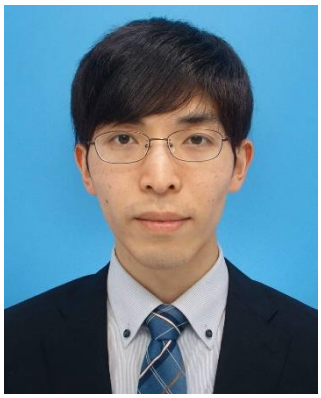
Speaker: Morteza Hasanvand

Education:
BSc: Shiraz University
Master: Sharif University of Technology
PhD: Yokohama National University

Title: **Edge-decompositions of $\mathbf{O(m)}$-edge-connected graphs into isomorphic copies of a fixed tree of size $\mathbf{m}$**

Abstract: In 2006 Barát and Thomassen conjectured that for every tree T of size m, there exists a positive integer k_T such that every k_T-edge-connected simple graph of size divisible by m admits a T-edge-decomposition. To prove this conjecture, the first attempts were made by Thomassen (2008) who proved it for the 3-path and the 4-path by giving the sufficient edge-connectivity 171 and $10^{10^{10^{14}}}$, respectively. Later, this conjecture is partially proved for several families of trees including paths, starts, a certain family of bistars, and trees with small diameter. Finally, it completely confirmed by Harutyunyan, Le, Merker, and Thomassé (2017) who gave a factorial upper bound on the necessary edge-connectivity. In this talk, we introduce some recent improvements on the necessary edge-connectivity for all trees (in particular, for paths and several small given trees). More precisely, we will show that every $O(m)$-edge-connected simple graph G of size divisible by m with minimum degree at least $2^{O(m)}$ has an edge-decomposition into isomorphic copies of any given tree T of size m. In particular, the minimum degree condition can be dropped for graphs G with girth greater than the diameter of T.



Speaker: Masaki Kashima
Keio University

Education:
BSc: Keio University
Master: Keio University
PhD: Keio University

Title: **Odd coloring of outerplanar graphs and related classes**

Abstract: An odd coloring of a graph is a proper coloring such that every non-isolated vertex has a color that appears at an odd number of neighbors of the vertex. This notion was introduced by Petruśevski and Škrekovski in 2022 and has been actively studied since then. In this talk, I will talk about my recent research on odd coloring of outerplanar graphs and related classes of graphs. This talk partially depends on a joint work with Xuding Zhu and a joint work with Kenta Ozeki.

Speaker: Saeid Bagheri
Malayer University

Education:
BSc: Lorestan University
Master: Isfahan University of Technology
PhD: Heinrich Heine Universitaet Duesseldorf

Title: A Graph associated to essentiality of submodules of a module

Abstract: Let R be an associative ring with identity. In this talk to every R-module M a simple graph $\Gamma_e(M)$ is associated which is called the *essentiality graph* of M. The vertices of $\Gamma_e(M)$ are nonzero submodules of M and two distinct vertices K and L are considered to be adjacent if and only if $K \cap L$ is an essential submodule of $K + L$. We observe the relationship between some module theoretic properties, such as minimality and closedness of submodules of an R-module M with some graph theoretic properties of $\Gamma_e(M)$. We will see that in general, this graph is not connected. But in some cases, it is complete or a union of complete connected components. I give some examples illustrating each specific case. (This is joint work with Mehdi Ebrahimi Dorcheh.)

Speaker: Yumiko Ohno
Tokyo University of Technology

Education:
BSc: Ochanomizu University
Master: Yokohama National University
PhD: Yokohama National University

Title: **Achromatic number and facial achromatic number of connected locally-connected graphs**

Abstract: A graph is locally-connected if the neighborhood of each vertex induces a connected graph. It is well known that a triangulation on a closed surface is locally-connected, and some results for triangulations were generalized to those for connected locally-connected graphs. In this talk, we extend two characterization theorems of triangulations for a complete coloring and a facial complete coloring, which are vertex colorings with constraints on the appearance of color tuples, to those of connected locally-connected graphs.

Speaker: Bahman Ahmadi
Shiraz University

Education:
BSc: Zanjan University
Master: Sharif University of Technology
PhD: University of Regina

Title: Optimizing information ratio of graph access structures

Abstract: In cryptography, secret sharing is a fundamental cryptographic technique that allows a secret to be distributed among a group of participants so that only authorized subsets can reconstruct it, while unauthorized subsets learn nothing. The set of authorized subsets forms an access structure. A crucial efficiency measure is the information ratio of an access structure, defined as the ratio between the maximum share size and the secret size. In this talk, we will focus on graph access structures, where the participants and access structure are modeled as a graph. We will discuss about some results optimizing the information ratio in some specific families of graph access structures.

Speaker: Analen Malnegro
Ateneo de Davao University

Education:
BSc: University of Southeastern Philippines
Master: Mindanao State University - Iligan Institute of Technology
PhD: Mindanao State University - Iligan Institute of Technology

Title: **An H-coloring of the line graph of cubic graphs and its related properties**

Abstract: Let G be a simple graph and H be a graph possibly having multiple edges but without loops. A k-regular graph is a graph in which all vertices have degree k. A 3-regular graph is also called cubic graph. Note that the line graph of a cubic graph is a 4-regular graph. An H-coloring of a graph G is a mapping $f: E(G) \to E(H)$ such that for each vertex u in G, there exists a vertex a in H such that $f(\partial_G(u)) = \partial_H(a)$, where $\partial_G(u)$ and $\partial_H(a)$ are the sets of edges incident with u in G and a in H, respectively. If G admits an H-coloring, then it can be written as $H \prec G$. It is well-known that any 4-regular graph G has a *cycle decomposition*, which is a partition of $E(G)$ into edge-disjoint cycles. If we restrict each cycle of the cycle decomposition with an even cycle, then it is called an *even cycle decomposition*. For a cycle decomposition, we color each cycle of the decomposition so that the cycles sharing a vertex do not receive the same color. Hence, the union of cycles in each color class is a 2-regular subgraph. For the minimum number m of colors required for such a coloring, the cycle decomposition is said to be of size m or of index m. A *2-factor* of a graph is a spanning subgraph in which every vertex is of degree exactly 2. A 2-factor is *even* if each component is an even cycle. Mazzuoccolo, Tabarelli and Zerafa [1] proved that (i) for any $r > 3$, there does not exist a graph H such that every r-regular graph admits an H-coloring, and (ii) for every $r > 1$, there does not exist a graph H such that every $2r$-regular simple graph admits an H-coloring. Thus, we cannot expect that a graph H satisfies that all 4-regular graphs admit an H-coloring. In this talk, we introduce some graphs H such that the H-colorability of the line graph of cubic graphs is significant and has relevance to some properties such as an even cycle decomposition of size 3 and an even 2-factor. (This is joint work with Kenta Ozeki.)

[1] G. Mazzuoccolo, G. Tabarelli and J.P. Zerafa, On the existence of graphs which can colour every regular graph, Discrete Applied Mathematics 337 (2023), 246-256.

Speaker: Mohammad Hassan Shirdareh Haghighi
Shiraz University

Education:
BSc: Shiraz University
Master: Shiraz University
PhD: Shiraz University

Title: Breaking symmetries, distinguishing polynomials of group action

Abstract: Let G be a group acting on a finite set X. A k-coloring $c: X \to \{1,2,\dots,k\}$ is called symmetry breaking, or distinguishing, if the only element of $g \in G$ for which $c(gx) = c(x)$ for all $x \in X$, is the identity. We show that the number of distinguishing k-colorings of X is a monic polynomial in k of degree $|X|$; which we call it the distinguishing polynomial of X. Examples include the vast majority of discrete structures like graphs and finite groups, on which their automorphism groups act.

Speaker: Shinya Fujita
Yokohama City University

Education:
BSc: Tokyo University of Science
Master: Tokyo University of Science
PhD: Tokyo University of Science

Title: On the hop domination number of a triangle-free graph

Abstract: For a graph G, a subset S of $V(G)$ is a *hop dominating set* of G if every vertex not in S has a 2-step neighbor in S. The *hop domination number* of G is the minimum cardinality of a hop dominating set in G. We discuss upper bounds on the hop domination number in triangle-free graphs with minimum degree at least 2. (This is joint work with Boram Park from Ajou University.)