**Resolución Consejo Directivo**

**Número:** RESCD-2023-849-E-UBA-DCT#FCEN

CIUDAD DE BUENOS AIRES
Jueves 11 de Mayo de 2023

**Referencia:** EX-2023-01802701- -UBA-DMESA#FCEN - POSTGRADO - Sesión 08/05/2023

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**VISTO:**

La nota presentada por la Dirección del Departamento de Ciencias Geológicas, mediante la cual eleva la información del curso de posgrado Principios de Geología Isotópica para el año 2023,

**CONSIDERANDO:**

lo actuado por la Comisión de Doctorado,

lo actuado por este Cuerpo en la sesión realizada el día 8 de mayo de 2023,

en uso de las atribuciones que le confiere el Artículo 113º del Estatuto Universitario,

**EL CONSEJO DIRECTIVO DE LA FACULTAD**

**DE CIENCIAS EXACTAS Y NATURALES**

**R E S U E L V E:**

**ARTÍCULO 1º:** Aprobar el nuevo curso de posgrado **Principios de Geología Isotópica** de 128 horas de duración, que será dictado por el Dr. Héctor Adolfo Ostera con la colaboración del Dr. Sebastián Oriolo.

**ARTÍCULO 2°:** Aprobar el programa del curso de posgrado **Principios de Geología Isotópica** que como anexo forma parte de la presente Resolución, para su dictado en el primer cuatrimestre de 2023.

**ARTÍCULO 3**°: Aprobar un puntaje máximo de cinco (5) puntos para la Carrera del Doctorado.

**ARTÍCULO 4°:** Establecer que el presente curso no será arancelado (**CATEGORÍA 1).**

**ARTÍCULO 5°:** Disponer que, de no mediar modificaciones en el programa, la carga horaria y el arancel, el presente Curso de Posgrado tendrá una vigencia de cinco (5) años a partir de la fecha de la presente Resolución.

**ARTÍCULO 6º:** Comuníquese a todos los Departamentos Docentes, a la Dirección de Estudiantes y Graduados, a la Biblioteca de la FCEyN y a la Secretaría de Posgrado con copia del programa incluida. Cumplido, pase a GEOLOGIA#FCEN y resérvese.

**ANEXO**

**Programa**

1. Geología Isotópica, definición y orígenes.

2. Estructura atómica de la materia. Origen de los elementos. Isótopos estables e inestables. Fraccionamiento isotópico. Constantes de equilibrio en las reacciones de intercambio isotópico. Mecanismos de decaimiento y transformaciones radiactivas.

3. Análisis instrumental. Técnicas de medición de abundancia relativa y absoluta de los isótopos. Espectrometría de masas.

4. Isotopos estables del oxígeno y el hidrógeno en la hidrosfera. Distribución y ciclo en la naturaleza. La notación delta. Interpretación de isótopos ambientales en combinación con hidroquímica en hidrología subterránea. Técnicas isotópicas aplicadas al desarrollo y manejo de los recursos hídricos.

5. Isótopos estables del azufre, carbono y nitrógeno en la hidrósfera y la litósfera. Distribución y ciclo en la naturaleza. Isótopos estables del oxígeno e hidrógeno en la litosfera. Utilización de isótopos ambientales como trazadores y monitores ambientales. Técnicas isotópicas aplicadas al estudio de cambios pasados y presentes en la hidrosfera y atmósfera (Global Change). Cronoestratigrafía isotópica

6. Geotermometría isotópica. Aplicación de los isótopos estables como geotermómetros. Geotermia. Utilización de los isótopos estables en el modelado de sistemas geotérmicos.

7. Geocronología. Principios básicos. Ecuaciones generales. Métodos radimétricos. de acumulación. Generalidades.

8. Método K-Ar: Principios y técnicas experimentales. Temperaturas de bloqueo. Isocronas K-Ar. Datación de rocas ígneas, metamórficas y sedimentarias. Limitaciones. Correlación con paleomagnetismo. Método 40Ar/39Ar: Principios.Técnicas experimentales. Difusión y “recoil”. Desgasificado por etapas. Espectro de edades. Isocronas. Historia térmica. Exceso de 40Ar. Ventajas y limitaciones.

9. Método Rb /Sr. Principios y metodología. Geoquímica del Rb y Sr. Isocronas. Programas de cálculo. Geología isotópica del Sr en meteoritos . Evolución del Sr en la Tierra. Datación de rocas ígneas, metamórficas y sedimentarias. Sistemas abiertos y cerrados. Limitaciones. Evolución de los isótopos del Sr en el agua de mar.

10. Método Sm/Nd. Principios y metodología. Geoquímica del Sm y Nd. Isocronas. Evolución del Nd en el sistema solar y la tierra. Edades modelo CHUR y DM. Edades de proveniencia. Aplicaciones del método en rocas ígneas, metamórficas y sedimentarias.

11. Método Lu/Hf. Geoquímica del Lu y el Hf. Evolución del Hf en el manto y la corteza. Método Re-Os. Geoquímica del Re y el Os. Evolución del Os en el manto y la corteza. Aplicación en depósitos minerales. Otros métodos de acumulación: K- Ca, La-Ce y La-Ba. Principios y técnicas experimentales. Aplicaciones.

12. Métodos isotópicos. U-Th-Pb Principios y técnicas experimentales. Geoquímica del U, Th y Pb. Las series de decaimiento del U y Th. Diagrama de concordia. Datación de rocas ígneas, sedimentarias y metamórficas. Modelos. Datación de granos individuales de zircón. Método Pb - Pb. Isocronas. Método del plomo común. Modelo Holmes - Houtermans. Modelos de dos etapas, Modelos complejos. Aplicaciones a medio ambiente y prospección de yacimientos.

13. Isótopos de gases nobles: He, Ar, Ne y Xe. Principios y técnicas experimentales. Evolución de la atmósfera terrestre.

14. Utilización de los isótopos del Sr, Nd, Pb, He y Hf en petrología. Combinación con isótopos estables. Comportamiento en la evolución magmática (Modelos CF, ACF). Procesos de mezcla de componentes y modelado. Ejemplos sudamericanos y argentinos.

15. Geodinámica isotópica. Evolución temporal de la corteza y el manto terrestre. La acreción cortical. El manto primitivo. Isótopos en el estudio de la génesis y evolución del sistema solar.

16. Aplicación de isótopos radigénicos en metalogénesis de depósitos minerales.

17. Métodos radimétricos de decaimiento: nucleidos cosmogénicos. Métodos 14C y Tritio. Principios y técnicas experimentales. 14C: Variaciones seculares, efecto reservorio, datación de carbonatos y aguas subterráneas. Tritio en la atmósfera. Métodos 26Al y 10Be.Producción en la atmósfera. Tiempos de residencia. Datación de sedimentos. Be en rocas volcánicas. Datación de hielo y aguas subterráneas con nucleidos cosmogénicos.

18. Desequilibrio radiactivo en series del U. Fundamentos, técnicas experimentales y principales métodos: 234U, 230Th, 210Pb. Aplicaciones en procesos de corto término: evolución de cámaras magmáticas y dorsales oceánicas.

19. Daño por radiación: Trazas de Fisión. Principios y técnicas experimentales. Temperaturas de cierre y aplicaciones. Tasas de ascenso y subsidencia. Termoluminiscencia y ESR. Principios y técnicas experimentales. Aplicaciones. Otros métodos de datación (racemización de aminoácidos, métodos químicos).

20. El tiempo geológico. Edades. Escalas.

21. Técnicas isotópicas aplicada a estudios del medio ambiente. Isótopos de

gases nobles aplicados como trazadores en estudios ambientales. Isótopos artificiales. Contaminación radiactiva del ambiente continental y marino. Conceptos básicos de seguridad radiológica. Impacto ambiental de la liberación de radionucleidos en el medio acuoso. Disposición de residuos radiactivos. Aplicaciones combinadas en atmósfera, hidrosfera y litosfera.

23. Trazadores isotópicos naturales y artificiales en geología del petróleo. Metodologías y conceptos fundamentales. Modelado en inyección de trazadores radiactivos naturales y artificiales. Determinación de permeabilidad y porosidad. Producción y recuperación secundaria. Localización de fracturas. Almacenamiento y transporte de fluidos. Pérdidas y filtraciones.

24. Disposición de residuos radiactivos. Técnicas isotópicas aplicadas al estudio de sitios de disposición final. Reactores naturales. Estado del arte y nuevas aplicaciones y metodologías en geología isotópica.

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